creative computing

September 1981, Vol 7 No 9, $2.50

BUYER'S GUIDE

TO PERSONAL COMPUTERS, VIDEO & ELECTRONIC GAMES, AND CONSUMER ELECTRONICS

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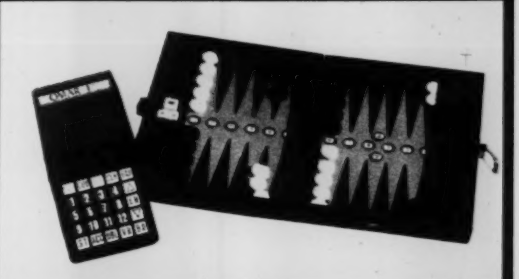
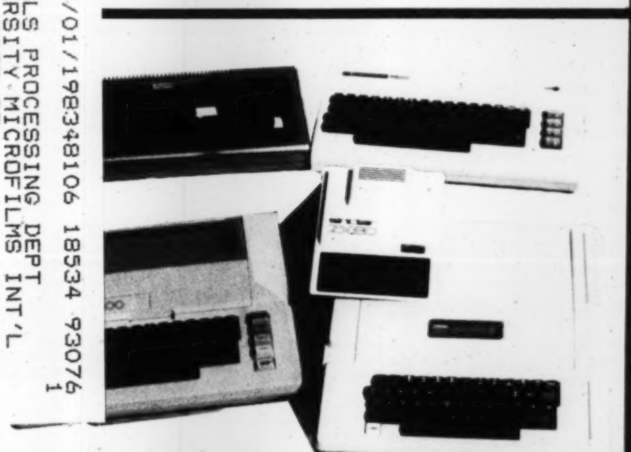
LEXOR





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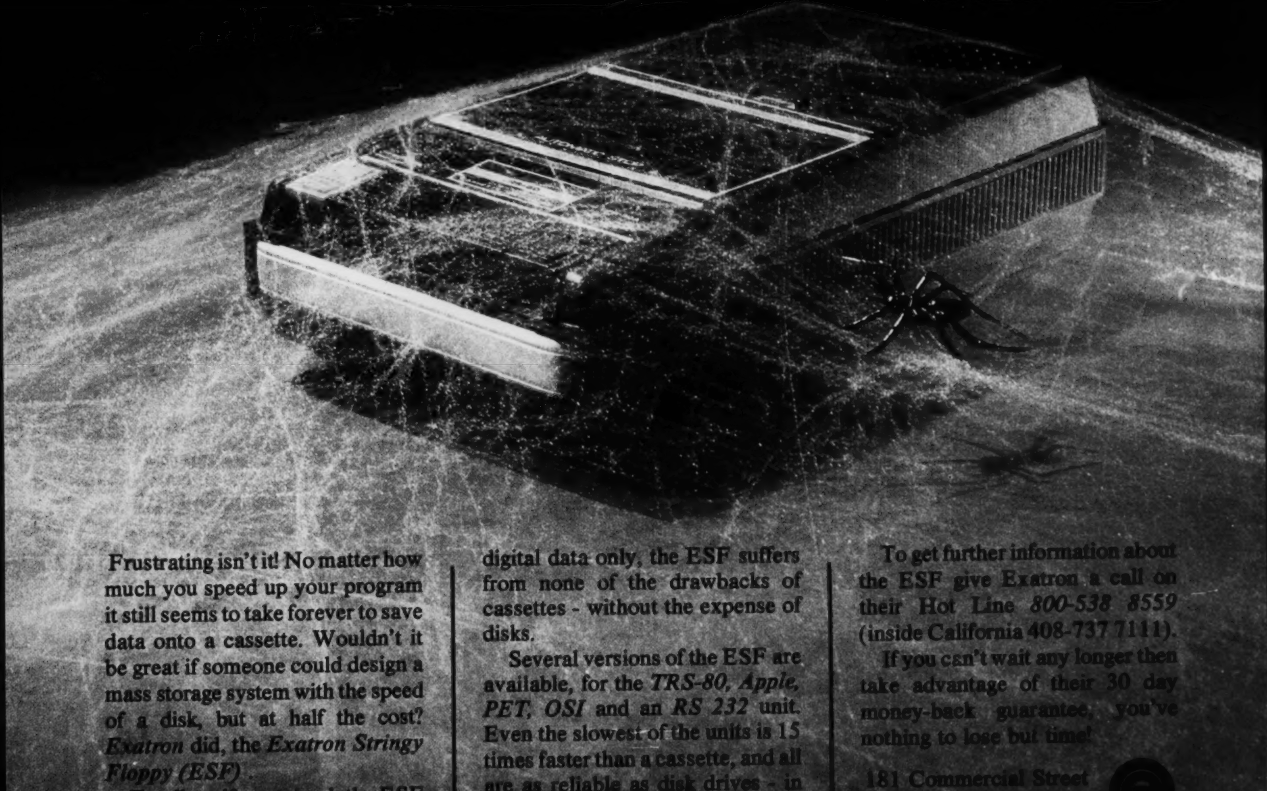

Frustrating isn't it! No matter how much you speed up your program it still seems to take forever to save data onto a cassette. Wouldn't it be great if someone could design a mass storage system with the speed of a disk, but at half the cost? *Exatron* did, the *Exatron Stringy Floppy (ESF)*.

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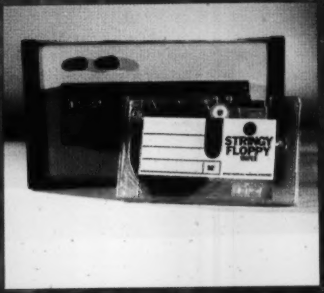

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CIRCLE 174 ON READER SERVICE CARD

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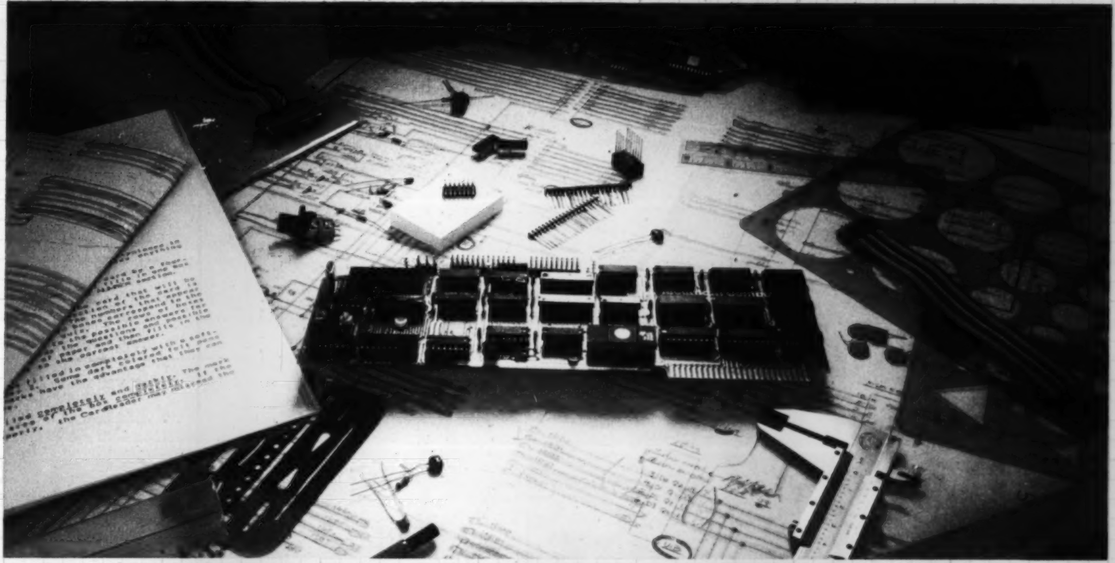

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Volume 7, Number 9

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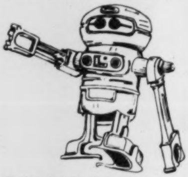

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on the cover

Electronic Games. Top row: Alien Attack (Coleco), Bank Shot (Parker Bros.), Lexor (Selchow & Righter). Middle row: Football (Bambino), Space Invader (Entex), Race 'N' Chase (Bambino). Bottom Row: Reflex (Parker Bros.), Supersonic Mastermind (Invicta), Dark Tower (Milton Bradley), Scrabble Sensor (Selchow & Righter).

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foreign customers

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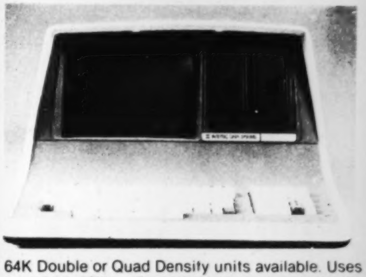

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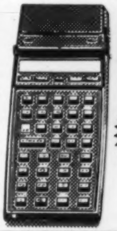

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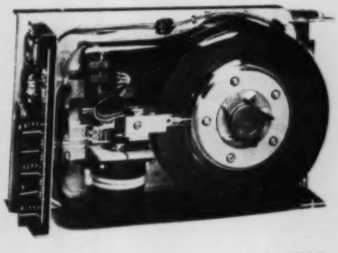

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Editors and Advertisers: The Faust Syndrome

Betsy Staples

A reader came to our booth at a recent computer show and expressed concern that we were selling our editorial souls for advertising dollars. We assured him that nothing could be further from the truth. In fact, we said our primary allegiance has always been to our readers, and we work hard to maintain the editorial independence that allows us to fulfill that commitment.

Our critic cited the fact that advertisements for products being reviewed in *Creative Computing* are often found on the pages near the evaluations. His conclusion was that the advertisers had linked their agreement to place the ads with a requirement that we publish a favorable review of the product in the same issue.

While we suspect that such deals may be made by other publications, we have never had to resort to this technique to attract advertisers. The actual sequence of events leading to the appearance of an ad near a review is as follows: First we accept the review for publication, then we notify the manufacturer of the product that it will appear and tell him in which issue we plan to use it. Some manufacturers elect to place advertising in the issue; others do not. The review appears as scheduled, regardless of the manufacturer's decision.

We feel that it is a courtesy to both the reader and the manufacturer to provide the manufacturer with the opportunity to present ordering information and additional facts about the product being reviewed or other similar products. Anything that simplifies the ordering process is a service for both.

The manufacturer, by the way, does not see the evaluation before it appears in print. The only exception to this rule occurs when we publish a very negative or critical piece to which we feel it is only fair to allow the manufacturer to respond at the time the article appears.

Which brings us to another point: negative evaluations. We do occasionally receive a totally negative evaluation of a product. We usually don't bother to publish these, not because we fear the wrath of the manufacturer, who may or may not be an advertiser, but because we would rather use our valuable editorial space to tell people about products that will increase the usefulness of their computers.

Of course, most products do have shortcomings, and we are not reluctant to be candid in presenting them. But if a product is so bad that the reviewer can't find *anything* good to say about it, then its reputation will probably have killed it by the time a review could appear in these pages, and no purpose will have been served by printing it.

The exception to this policy is in a comparative review where we compare several products of the same type. In this instance, if one is clearly inferior, we will take a few paragraphs to say so. (See "Of Cabbages and Kings" by Stephen Kimmel in the August issue of *Creative Computing*.)

The final concern of our critic was the appearance of ads for other Creative Computing products in the magazine. In response to this we explained that Creative Computing Press, Creative Computing Software, *Microsystems* and *SYNC* are separate divisions of the parent company, Ahl Computing Inc. They have separate accounting systems, and their respective managers are free to place advertising wherever they feel it will get the best response. Their accounts are cross-charged for ads placed in *Creative Computing*, and their profitability is affected by the results.

As for editorial coverage of the products sold by other divisions, in an effort not to appear self-serving, we usually cover them only when writing about a group of similar products—educational simulations, for example. And if they fail to measure up, we're honest enough to let you know where the problems lie. (See "Of Cabbages and Kings" in the August issue.)

The point of all this is to assure you, the reader, that we will not compromise the integrity of our editorial coverage. We know that many of you have come to depend on us for unbiased information as you consider the purchase of hardware and software, and we want you to know that we value your confidence and will do our best to continue to deserve it. ☐

Kaves of Karkhan™

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In Dragon Fire they fought Salmadon to seek great wealth. Their newest mission is to **save mankind!**

- Can they replace the jewel of Maldamere before his unspeakable evil overcomes them?
- Thrill to subterranean hazards like crumbling walls, decaying stairs, falling boulders and fearsome night creatures.
- You are one of the adventurers. You choose a group of crusaders to travel the treacherous paths and pitfalls of Karkhan with you.
- None of the group can journey through the dark and dreary caverns without you.
- The Wizard has managed to contain Maldamere's spirit for a short time. You must wend your way through the Kaves as quickly as possible before Maldamere consumes the Wizard. Your sole purpose is to place a magical stone on the bier of Maldamere at the top of Mt. Karkhan.

Kaves of Karkhan is just as challenging as Dragon Fire. Its animation, Hi-Res 3-D graphics, and time constraints add extra excitement. Even if you've never played Dragon Fire, you'll enjoy the Kaves of Karkhan from **Level-10**, a division of **DAKIN5.**

Kaves of Karkhan is written for the Apple II Plus and Apple II with 1 disk drive, 48K RAM and Applesoft ROM.

Kaves of Karkhan and Dragon fire are trademarks of Level-10. Level-10 is a trademark of Dakin5 Corporation. Apple is a trademark of Apple Computer Inc.

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Reddy Chirra improves his vision with an Apple.

Reddy is an optical engineer who's used to working for big companies and using big mainframes.

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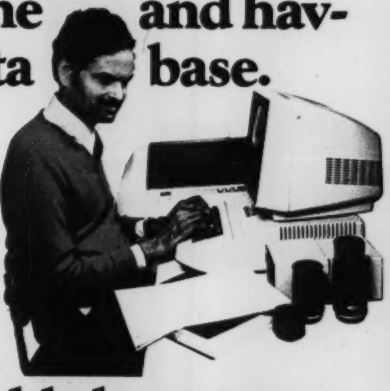
And, like thousands of other engineers

and scientists, quickly learned the pleasures of cutting down on shared time and having his own tamper-proof data base.



His Apple can handle formulas with up to 80 variables and test parameters on 250 different optical glasses.

He can even use BASIC, FORTRAN, Pascal and Assembly languages.

And Apple's HI-RES graphics come in handy for design.

Reddy looked at other microcomputers, but chose Apple for its in-depth documentation, reliability and expandability.

You can get up to 64K RAM in an Apple II. Up to 128K RAM in our new Apple III. And there's a whole family of compatible peripherals, including an IEEE-488 bus for laboratory instrument control.

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CIRCLE 106 ON READER SERVICE CARD

What can you honestly expect from an interactive data terminal that costs only $369?*

SALES PER ANNUM = MEGA BUCKS
80M
60M
40M
20M
0M
1977
1978
1979
1980
1981
RCA

Well, to begin with, color graphics.

RCA's VP-3301 has unique color-locking circuitry that gives you sharp, jitter-free color graphics and rainbow-free characters.

Plus much more: Microprocessor control. Resident and programmable character set. Reverse video. State-of-the-art LSI video control. 20 and 40 character formats. RS232C and 20 mA current loop. Six baud rates. Eight data formats. ASCII encoding. Light-touch flexible-membrane key switches for reliability and long life. CMOS circuitry and a spill-proof, dust-proof keyboard for hostile environments.

The VP-3301 can be used with a 525-line color or monochrome monitor or a standard TV set through an RF modulator.** It serves a wide variety of industrial, educational, business and individual applications including communication with time sharing and data base networks such as those provided by Dow Jones News/Retrieval Service, CompuServe and Source.

All this—for the low price of $369. And it's made by RCA. So get the whole story about the surprising VP-3301 today. Write RCA MicroComputer Marketing, New Holland Avenue, Lancaster, PA 17604. Order toll-free: 800-233-0094.

**Model VP-3303 with *built-in* RF modulator—$389.
*Suggested user price. Monitor and modem not included.

RCA

CIRCLE 244 ON READER SERVICE CARD

Dear Subscriber:

"What's this?" you say. "A Buyer's Guide? I didn't order this."

If you examine the cover closely, you will see that this is your September issue of *Creative Computing*, but since it is a little out of the ordinary, we thought we'd better explain.

As we mentioned last month, the October issue of *Creative* will be distributed nationally on newsstands for the first time. This means that our circulation should increase substantially, allowing us to attract more advertisers and produce a better magazine for you.

It also means that in order to produce a magazine with a cover date that newsstand operators will consider current, we have had to "take a tuck" in our production schedule. In essence, we have had to produce the August, September and October issues of *Creative Computing* in the time it usually takes to prepare two issues.

This Buyer's Guide is sent to you as your September issue, and in early September, you should receive your October issue, which will have the educational emphasis we used to carry in September. Thereafter, your copy of *Creative* will arrive about the second week of the month preceding the month printed on the cover, i.e., you should receive your January 1982 issue around the tenth of December.

Buyer's Guides purchased in computer stores or newsstands, carry a Winter 1982 cover date and will be on sale for the entire pre-Christmas buying period.

At present, we plan to publish two or three Buyer's Guides per year, each with a different emphasis. They will be distributed primarily through retail outlets, but will also be available by mail through our regular ordering channels. Watch these pages for announcements of the topics to be covered.

We have covered a wide range of product categories in this issue, and hope you will find more than one of interest. Please let us know what you think of this, our first Buyer's Guide.—*Betsy Staples*

row...dateline:tomorrow...da

David H. Ahl

UNDER $1000 COMPUTER FROM XEROX

Hot on the heels of the unveiling of the Star at NCC and 820 small business computer in June, Xerox is quietly moving toward announcing an even lower-end machine. Internally, called Sunrise, it is based on the Z80 mpu, has 16K of memory (expandable to 256K), 64K ROM, an 80 character by 25 line display, color graphics, RS-232 interface and RF modulator. Target price is $995.

Industry sources feel, as we do, that the price is not a breakthrough and that software availability will determine the success or failure of the unit.

DEC LOW-END ENTRY TOO?

Despite Ken Olsen's 1977 presentation to the World Future Society in which he declared he could see no possible reason to have a computer in the home, DEC (Digital Equipment Corp.) seems to be on the verge of introducing a low-end product. Ken Olsen, founder and president of the giant Maynard, MA. based minicomputer manufacturer may have changed his mind when his daughter begged for a computer at home.

The new unit is rumored to be based on the venerable PDP-8 in yet another guise. The PDP-8 has been around since 1967 and thus is probably the longest-lived computer family ever manufacturered. I have no details on this new product; can anyone help?

ZILOG ADDS BASIC TO Z80 MPU

While some "people in the know" ridicule Basic as archaic and a dead end language, Zilog seems to feel otherwise. Makers of the Z80 mpu used in the TRS-80 and other computers, Zilog has announced the Z8671 which executes Basic directly. It is similar to the Z80 but has a Basic interpreter masked onto the 2K-byte internal read-only memory of the chip. Price is under $25.

"YOU'LL BE GLAD TO KNOW" DEPARTMENT

Four computer magazines (two personal, two professional) recently ran big (6-page) articles about radiation dangers from video terminals. We chose not to. I think we were right.

The U.S. Food and Drug Administration (FDA) recently reviewed all the studies and data collected on video terminals. Some of these studies were conducted by the FDA's Bureau of Radiological Health which is responsible for assuring the safety of radiation emitting products and by the Occupational Safety and Health Administration which conducts research on workplace hazards.

Their conclusions: "Video display terminals emit little harmful radiation and generally pose fewer risks than such commonplace items as TV sets, fluorescent lights and space heaters."

There. Three paragraphs. That's all the subject is worth. I hope you agree.

GOT SOME INFO?

Judging from your calls and letters, this page seems to be popular. I put it together by "keeping my ear to the ground." However, I'm happy for input. Facts preferred. Rumors accepted. Gossip rejected. Written notes (nothing fancy) strongly preferred to phonecalls. Sources kept confidential unless you wish otherwise. Let me hear from you.

Which Computer Is For You?

Betsy Staples

"Which computer should I buy?" The first time I heard someone ask this question I was all ears: how would my new co-workers at Creative Computing, who knew all about these little computers, answer? Three years later, I have become accustomed to the question, and equally accustomed to the answer, which hasn't changed: "It depends on what you want to do with it."

Sometimes, the questioner, trying to brush aside what he feels is an evasive answer, will persist: "But which computer do you use at Creative Computing?"

"Well," we reply "we have quite a few TRS-80s (Models I and III), a bunch of Apples, several Ataris, a couple of PETs, a Sorcerer, a TI 99/4, a TRS-80 Color Computer, a VIC-20, an LNW 80, an H-89, an Altair, an Imsai 8080, a Sol 20, a PDP-11/34, an IBM System 34 and dozens of Sinclairs, not to mention a miscellaneous assortment of others on short term loan for evaluation."

"But which one do you *use*?" comes the exasperated response.

"It depends on what we want to do," we say calmly, completing the first lap of the vicious circle.

And it really does . . . . If you are considering the purchase of a computer, the first thing you must do is decide what you want to do with it.

If you are motivated by a desire to improve the efficiency of your small business, for example, your criteria will develop differently than if you are an artist or musician looking for a new medium through which to express yourself.

If you are an engineer, your needs will differ from those of a professional writer. An elementary school teacher will have different requirements from a high school physics teacher, and a person who just wants to find out what personal computing is all about will have a different approach from a professional programmer looking for something to do on a busman's holiday.

Once you have decided on the primary use to which you want to put your computer, you might also want to consider possible secondary uses. Will another member of the family want to use the machine, which you have purchased to keep track of a general ledger, for word processing? Will the children be disappointed if they can't play games on it?

First the Software

Now, armed with a clear idea of exactly what you want to accomplish with your computer, you can begin to investigate the software available to help you accomplish it. As our publisher is fond of saying, "hardware without software might as well be a boat anchor," and since there are many things less expensive than computers that can be used for boat anchors, it is important to know what software is available.

If you find the software you want, the choice of hardware will probably follow very logically and painlesly. For example, we purchased our PDP-11/34 because the software we wanted to handle our subscription fulfillment was written for that machine. When we decided to computerize the rest of our internal accounting functions, we told ourselves we wanted hardware that would be compatible with the 11/34, of which we had become quite fond.

It soon became apparent that the creation of software for the internal accounting would have to be a custom job, so we consulted several software houses, only one of which presented a comprehensive proposal at a relatively reasonable price. Although the proposed system would do everything we needed, we were forced to abandon our dreams of compatibility, because the software was for an IBM System 34.

In the same manner, on a slightly smaller scale, a consulting engineer of our acquaintance recently purchased three TRS-80 Model IIIs for his business solely on the strength of an air conditioning design package offered by the Carrier Corporation for that machine. He needed to design air conditioning systems and he found the software to do it. The decision to buy the TRS-80 was made for him. He has since discovered word processing, and we've heard rumors about draftsmen becoming engrossed in Adventures during lunch hours, but these are secondary uses which played no part in his decision to buy.

Of course, if you are a programmer with sufficient experience to write your own software, you can skip this step and proceed with the purchase of the hardware.

Then the Hardware

Perhaps you have found the perfect software, it is available for only one machine and you are satisfied. Great. But what if there are several packages that meet your needs, and each is written for a different computer? Or what if the manufacturer sells the same super package for several machines?

Obviously, the field from which you will choose has been narrowed, but there are still some things to consider.

Lower Case

If you plan to use your computer for word processing, you will probably want both upper and lower case characters.

Computers for people.™

"Atari graphics and sound stand in a class by themselves."

David D. Thornburg
Compute Magazine, November/December 1980

"Its superiority lies in three areas: drawing fancy pictures (in color), playing music, and printing English characters onto the screen. Though the Apple can do all these things, Atari does them better."

Russell Walter
"Underground Guide to Buying a Computer"
Published 1980,
SCELBI Publications

"The Atari machine is the most extraordinary computer graphics box ever made..."

Ted Nelson
Creative Computing Magazine, June 1980

"...so well packaged that it is the first personal computer I've used that I'm willing to set up in the living room."

Ken Skier, OnComputing, Inc. Summer 1980

"...well constructed, sleekly designed and user-friendly—expect reliable equipment, and strong maintenance and software support."

Videoplay
December, 1980

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For further information write: Atari Inc., Computer Division, 1196 Borregas Avenue, Sunnyvale, CA 94086 Dept. C-31

CIRCLE 114 ON READER SERVICE CARD

Which Computer?, continued...

Some computers have both, some have only upper case. Some of the ones that have only upper case can be modified to include lower case. Some of these modifications are easier to use than others.

If you want to do word processing, you will need a printer, and will want to ask which printers work with which computers, what features they offer and how much they cost.

Graphics and Sound

Color, animation and sound may be superfluous on a computer purchased for word processing, but they can be useful, if not indispensable, for games and certain educational uses. They can also enhance charts and graphs created in the office.

Most of the popular computers available today have at least some graphics capabilities built in, but some go far beyond the basics. Graphics tablets, graphics printers and plotters to increase flexibility of input and output are available for some machines.

Some computers have sound capabilities, while others are mute. Sound can greatly enhance game playing, but doesn't add much to bookkeeping functions.

There are also music synthesizers available for some computers, and if you are musically inclined, you might want to make this one of your secondary criteria.

Expansion Options

If you are like most people who buy computers, you will soon outgrow the first system you buy. You will want more memory, a disk drive or two, a printer, or one of the hundreds of other peripherals on the market.

The time to consider expansion options is before you make the initial purchase. Once you have a particular machine, the growth of your system is limited by the provisions its manufacturer has made for expansion. On some computers, peripherals can be attached simply by plugging in a cable. On others, you may have to purchase an expensive interface before you can think of adding so much as a joystick.

You may be able to buy peripherals from several manufacturers or you may be limited to purchasing them only from the maker of the machine.

Service

What will you do if it breaks? Will you be able to take it back to the store from which you purchased it, will you have to send it back to the manufacturer, or will you be forced to find an independent person or company to repair it?

The personal computer industry is growing rapidly, and the number of service centers has not always kept pace with the proliferation of machines in the home and office.

Once you become dependent upon your computer, you will not want to be parted from it for long. Whether you are sending it for modification or repair, you will want fast, reliable service, so investigate the availability of service before you need it.

Price

The computers we use at Creative Computing range in price from $99.95 to $50,000. Obviously, the build-it-yourself ZX80 could not do the job of one of the minis, but the System 34 would be just as inappropriate for use in our Community Education Center. So a higher price tag does not automatically designate a better computer.

For certain applications, the low-end computers can do just as good a job as their more expensive relatives. For others they will be found woefully inadequate. Neither should you spend more than you can afford just because a certain computer has many features. If those features are not applicable to your use, you may never need them.

A higher price tag does not automatically designate a better computer.

There are always trade-offs when it comes to price. We could have equipped our Education Center with one of the higher priced, multi-featured personal computers, but we would have had to settle for far fewer of them. We decided, instead, that, in this case the opportunity for hands-on experience was more important than exposure to special features, so we bought a larger number of low-end computers so that each student could have one.

You may decide you would rather have a lower priced computer with a disk drive than a higher priced one with a cassette recorder. Or, you may need the extra features of the higher priced machine and be willing to put up with the inconvenience of the recorder to get them.

Where to Buy

Having decided what you are going to do with your computer, what software can do the job, and what computer you want to buy, you are faced with deciding where to buy it. Should you go back to your local ComputerLand, Radio Shack or independent computer store where you have already spent several hours playing with the equipment and asking questions? Or should you take advantage of some of the excellent discounts offered by mail order firms?

This is not an easy question to answer. If you are clever at such things and can install and repair the machine yourself, or don't mind taking your chances on getting it fixed when the time comes, then mail order may be a good alternative for you. By shopping carefully, you can often save a substantial amount of money on hardware purchases.

If, however, your system will be composed of components from several hardware manufacturers which have to be put together or you are likely to need fast service on your system, you would do well to consider paying a little more for your computer in order have ready access to the knowledgeable folks at your local computer store.

Where to Find the Information

"This is all well and good," you say, "but where can I find all this information on everything from software to service?"

Obviously computer stores are a good source of information about the brands they sell, user's groups can list the advantages of the computer owned by their members, and friends can tell you the pros and cons of their machines in a relatively unbiased manner.

Having exhausted those sources, however, you may still find yourself hungry for information. Magazines are probably the best source of up-to-date, unbiased evaluations of the products on the market. If the current issue doesn't mention the product you are looking for, get an index and look for it among the back issues.

Some magazines are devoted to a specific computer; others are of more general interest. Both can be useful in investigating the applications and products available to the prospective computer owner.

Evaluations by current users list the good and bad features of the product, describe some of the best uses for it and evaluate the documentation. If the writer has had any problems with repair or installation, he will also include the details of obtaining service. Evaluations of this sort can be extremely valuable to the prospective purchaser.

And don't overlook the advertisements and new product announcements. They often contain enough information to allow you to decide whether to consider the product further.

Which computer should you buy? If you do your homework as outlined above, you should have very little trouble deciding. ☐

THE BACKBONE OF YOUR SYSTEM

The Heath/Zenith 19 Smart Video Terminal gives you all the important professional features, all for under $700.* You get the flexibility you need for high-speed data entry, editing, inquiry and transaction processing. It's designed to be the backbone of your system with heavy-duty features that withstand the rigors of daily use.

Standard RS-232C interfacing makes the 19 compatible with DEC VT-52 and most computer systems. And with the 19, you get the friendly advice and expert service that makes Heath/Zenith a strong partner for you.

Pick the store nearest you from the list on page 00. And stop in today for a demonstration of the Heath/Zenith 19 Smart Video Terminal. If you can't get to a store, send $1.00 for the latest Heathkit® Catalog and the new Zenith Data Systems Catalog of assembled commercial computers. Write Heath Co., Dept. 355-806, Benton Harbor, MI 49022.

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Completely addressable blinking cursor lets you edit anywhere on screen.

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Keypad in calculator format permits fast, easy entry of numeric data.

---

*In kit form, F.O.B. Benton Harbor, MI. Also available completely assembled at $995. Prices and specifications are subject to change without notice.

355-816

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The prices quoted are only valid for stock on hand and all prices are subject to change without notice.

What Can You Buy for Under $1000?

David M. Doll

Who would have guessed as recently as ten years ago that you could ever purchase a computer for under $1000? Well, now you can not only purchase one in that range, you have quite a selection from which to choose. Here we describe twelve computers which range in price from $199.95 to just over $1000.

An effort has been made to compile a useful reference guide to help the prospective buyer in shopping for the machine which will provide the power, possibilities, and price that will make a specific machine the best personal choice. While some of these machines are marketed as home entertainment devices (electronic games as the modern equivalent of bread and circuses), the focus here will be on hardware as a computing machine.

While efforts have been made to consider the impact of some of the configurations in domestic settings, the ultimate and/or transitory configurations are beyond the scope of this review. The size of the initial computer may be most material in establishing just how personal it can be. A unit that is installed using the family TV as a CRT is likely to become the family computer with all that that implies. While the prospect of the entire family becoming computer literate is appealing, one cannot rule out the thought that eager fingers may be sticky as well.

Sinclair ZX80

The Sinclair ZX80 is compact enough to slip easily into a brief case or tote bag. Since the ZX80 weighs only 12 oz., it could be comfortably backpacked should Sinclair develop a solar pack as well as a tiny flat screen TV to serve as CRT. It is a computer that can be portaged or commuted with and still offer formidable power and a broad range of software programs.

David M. Doll, 1111 Arthur Ave., Racine, WI 53405.

The ZX80 uses Sinclair's own Z80A microprocessor chip for its CPU. The basic configuration comes with 5K of memory including Basic in residence. The ZX80 has a built in VHF RF modulator and socket for an audio cassette recorder. Sinclair currently offers an 8K ROM extended Basic chip for an additional $39.95 and a 16K RAM expansion module for $99.95. The expansion module which plugs into the back of the ZX80 is about the size of two audio cassettes and adds little to the size and weight of the console.

Sinclair ZX80 with 8K Basic and 16K RAM.

The 128-page ZX80 Operating Manual is a course in Basic programming. A compact printer for the ZX80 will be available later this year at under $100. Using a compact audio cassette recorder and an available TV, the total Sinclair ZX80 configuration can be set up on a card table (or a spatial equivalent).

The Sinclair ZX80 uses a pressure sensitive keyboard that is rugged enough to stand up to life in a briefcase and can be wiped clean—a boon to those who combine intake with input. With a list price of $199.95, the ZX80 makes it feasible to provide a "personal" computer for each member of the family (given the statistically average family membership) and still stay under the $1,000 mark.

SYNC is a bimonthly magazine devoted to applications for the ZX80. Packaged software, including games, is available so that the ZX80 can be said to seriously compete with the other machines in the admittedly broad classification of personal computer.

VIC-20

The Commodore VIC-20 is the first full-featured color computer introduced at under $300. The acronym VIC stands for Video Interface Computer and establishes the design as one which is intended to use any color TV set or monitor as a CRT. The combined memory of the VIC-20 is 21K with expandability to 32K possible. The VIC-20 uses a standard typewriter keyboard with special screen editing keys and PET graphics (66 keys).

The Commodore 6502 microprocessor chip serves as the CPU for the VIC-20. The three tone generators (with a five octave range) and the sound generator which uses the TV speaker suggest an obvious effort by Commodore's designers to bridge the market with appeal to the educational community, the game players, and the serious, but impecunious, computer amateur.

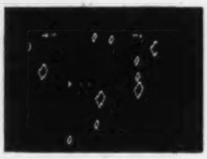
You could justify the cost of a VIC as domestic economy if there is a Space Invaders junkie in your household. (Think of all the quarters you would save.) However, this machine clearly reflects the serious and proficient heritage which the VIC shares with Commodore's PET. The

Commodore VIC-20.

Games from BIG FIVE will turn your computer into a

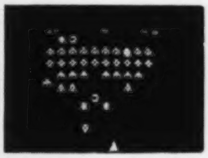
TRS-80 HOME ARCADE

SUPER NOVA©



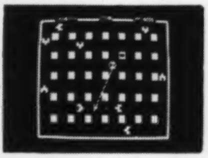
If you and your TRS-80 have longed for a fast-paced arcade-type game that is truly a challenge, then **SUPER NOVA** is what you've been waiting for. In this two player machine-language game, large asteroids float ominously around the screen. Suddenly your ship appears and you must destroy the asteroids before they destroy you! (But watch out because big asteroids break apart into little ones.) The controls that your ship will respond to are thrust, rotate, hyperspace, and fire. All right! You've done it! You've cleared away all the asteroids! But what is that saucer with the laser doing? Quick! You must destroy him fast because that guy's accurate! *As reviewed in May 1981* Byte *magazine.*

GALAXY INVASION©



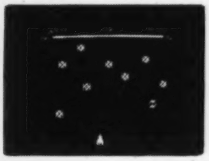
The sound of the klaxon is calling you! Cruel and crafty invaders have been spotted in battle formation warping toward Earth at an incredible speed. Suddenly, your ship materializes just below the huge flock of invaders. Quickly and skillfully you shift right and left as you carefully fire your lasers at them. But watch out! A few are breaking out of the convoy and flying straight at you! As the whine of their engines gets louder, you place your finger on the fire button knowing all too well that this shot must connect—or your mission will be permanently over! With sound effects!

ATTACK FORCE©



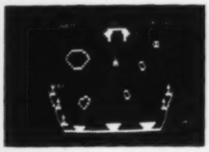
Your TRS-80 screen has been transformed into a maze-like playfield for this game. As your ship appears on the bottom of the screen, eight alien ramships appear on the top. All of them are traveling at flank speed directly at you! Quickly and boldly you move toward them and fire missiles to destroy them. But the more aliens you destroy, the faster the remaining ones become. If you get too good you must endure the wrath of the keeper of the mazefield: the menacing "Flagship". You must destroy him fast because, as you will find out, that guy's accurate! With sound effects!

COSMIC FIGHTER©



With thousands of stars whizzing by you, your **SPACE DESTROYER** ship comes out of hyperspace directly under a convoy of aliens. Almost effortlessly, you skillfully destroy every last one. But before you can congratulate yourself, another set appears. These seem to be slightly more intelligent than the first set. Quickly you eliminate all of them, too. But your fuel supply is rapidly diminishing. You must still destroy two more sets before you can dock with your space station. All right! The space station is now on your scanners! Oh no! Intruders have overtaken the station! You must skillfully fire your neutron lasers to eliminate the intruders from the station before your engines run out of fuel and explode! With sound!

METEOR MISSION II©



As you look down on your space viewer you can see the stranded astronauts that are crying out for you to rescue them. But first you must maneuver your shuttle down through the asteroids & meteors before you can reach them. Great! You've got one! But now can you get back to the space station to save your fellow shipmate or will you crash and kill both of you? You can fire your lasers to destroy the asteroids, but watch out, because there could be an alien FLAGSHIP lurking behind! Includes sound effects!

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Dealers: All games now available in full color packaging, please inquire.

Under $1000, continued...

VIC uses built-in Basic and 6502 machine language. The graphics resolution is 176 x 184 with a display capability of 22 x 23 characters. The color options include eight character colors, eight border colors, and 16 screen colors.

The I/O ports offer opportunities to add a modem, RAM and ROM cartridges, a cassette recorder, disk drive, or printer, and paddle, joystick, or light pen.

At seven pounds shipping weight including the power supply, the VIC is still within the briefcase class but a bit heavy for backpacking. The physical dimensions are approximately 16" by 10" by 3" so that reasonably compact configurations are possible.

The VIC is a very new entry into a growing market, but Commodore seems to have given careful thought to the design and to software and peripheral options. Moreover, initial sales of the VIC in Japan suggest that it will attract devoted fans in the U.S. market as well.

TRS-80 Color Computer

Radio Shack's TRS-80 Color Computer is the latest entry from the world's largest producer of personal computers. The console is available with a total of 12K at $399. Extended Basic is available either as an add-on for $99 or together with a 16K memory for $599. Certainly, there is something to be said for the opportunity to provide the family with a "game" computer and then add the range of peripherals and options as the budget permits and one's needs dictate.

Radio Shack TRS-80 Color Computer.

The TRS-80 uses 6809-2 microprocessor chip for its CPU. It can be programmed in Basic and will accept machine language commands. As might be expected from Radio Shack, the I/O ports accept a wide range of devices and include edge connectors for plug-in ROMs, software serial ports, two joystick ports which can be adapted for other peripherals, and a 1500 baud cassette port.

The Color Computer has 64 x 32 resolution which can be expanded to 256 x 192, and the screen display offers up to 32 x 16 characters. It will accept a serial printer and a disk drive will be available in the future. The TRS-80 incorporates a full size keyboard with 53 keys.

The Color Computer has a built-in RF Modulator. If one wishes, Radio Shack offers a TRS-80 13" Color Video Receiver for use as a CRT for $399. The Color Computer is a very recent addition to the field of personal computers but one can anticipate that Radio Shack will offer its not inconsiderable marketing skills and support to make it a serious contender. Radio Shack already mentions the future availability of printers and telephone modems. Certainly, no one seriously in the market for a personal computer would ignore this very personable machine pregnant with possibilities.

APF Imagination Machine

The APF Imagination Machine is available either as the APF IM-I which is designed to combine the MP100 TV game with an APF computer console, or as the IM-II Personal/Business Computer which includes two mini floppy disk drives. With a list price of $1599, the APF IM-II stretches the specified $1,000 for personal computers, but we will consider it along with its lower priced sibling.

The APF Imagination machine console uses a Motorola 6800 chip as its microprocessor. The initial configuration provides 8K of memory which can be expanded as in the IM-II to 41K with 27K of RAM and 14K of ROM. The 39 lb. weight of the Imagination Machine includes a built-in cassette recorder as well as a full-sized typewriter style keyboard with 53 keys. The dimensions are roughly 24" by 14" by 3" which is beginning to strain the average briefcase.

The Imagination Machine is programmable in either Basic or machine language and is expected to accept Level II Microsoft Basic software momentarily.

APF Imagination Machine I.

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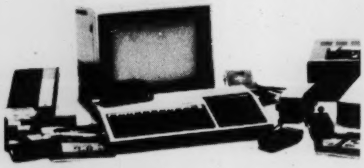
The IM-I and IM-II will interface with regular TV sets with the addition of an RF modulator or one can use the APFTVM-10 CRT.

The Imagination Machine equipped with the MP1000 TV game may appear frivolous to a casual observer, but a detailed examination of the MPA-10 computer console and the associated peripherals will establish the Imagination Machine as a serious personal computer with a growing range of software packages available from more than one source.

TI 99/4

Texas Instruments designates their 99/4 and 99/4A consoles as "home computers" which is a useful designation for domestic machines that are designed for a wide range of educational, entertainment, and management programs and uses.

The Texas Instrument 99/4A differs from the 99/4 in that it has a more typewriter-like keyboard and a more modest price tag. The TI 99/4 lists for $649.95 while the TI 99/4A lists for $525. These machines both use the 9900 16-bit microprocessor chip. The 99/4 and 99/4A come with 26K of internal ROM and 16K of RAM. The total memory capacity can be expanded to 72K.



Texas Instruments 99/4A with peripherals.

In addition to the supplied sound generator which offers three tones and a noise generator with a frequency range from 110Hz to beyond 40,000Hz. Texas Instruments also makes available a solid state speech synthesizer with 372 English words built-in and almost endless possibilities using TI's phoneme stringing technique.

Using the now optional TI 10" color monitor, one can get 24 x 32 characters with 192 x 256 resolution. These crisp visuals are available in a total of 16 colors. The monitor lists for $375, but an RF modulator listed at $49.95, now permits use of a regular TV set. The 99/4 and the 99/4A share dimensions of 10" by 15" by 2.5" (give or take a few centimeters) and weigh under 5 lbs.

The range of I/O ports available make it clear that Texas Instruments is focusing on the computer aspects of this product, making provisions for an RS-232 interface, printer, disk system, and telephone modem among others.

The 99/4 and 99/4A use TI extended Basic and can use TI Logo with the addition of Memory Expansion and Disk Memory System. TI issues a User's Newsletter and *99'er* is a bimonthly magazine recently introduced for users of the 99/4. There are also growing numbers of user groups as well as growing software support. The Texas Instrument 99/4 and 99/4A are very congenial computers for general consumers and have potential for serious computing as well.

Intellivision

Intellivision from Mattel Electronics began life as a formidable video game master component which was designed to accept a broad range of game cartridges.

Mattel Intellivision.

Now Mattel has scheduled release of a Keyboard Component with built-in cassette drive to form a promising combination with growing potential as a computer.

The Intellivision CPU is in the Master Component and uses a GI 16-bit microprocessor. The resident memory in the Master Keyboard combination includes 7K of ROM and 16K of RAM. As might be expected, the graphics resolution is a respectable 160 x 192 with 24 lines of 40 characters. There are 16 colors from which to choose and the system comes complete with an RF modulator for interfacing with domestic color TV sets.

Intellivision incorporates a 60-key typewriter-like keyboard with upper and lower case and specialized computer control keys. The Master Component and Keyboard Component combination includes parallel peripheral expansion ports plus access to the CPU bus. It would be an understatement to say that Mattel Electronics has not rushed headlong into the home computer market. They have, in fact, slipped delivery of the keyboard component about four times in the past two years. However, there is reason to suspect that the introduction of the Keyboard Component will be followed by a printer, voice synthesizer, and telephone modem.

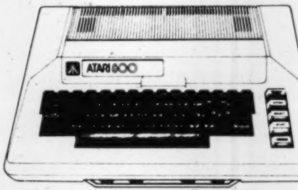
At this point, Mattel Electronics promises a Basic computer language cartridge. The prospect of more and more peripherals is tempting, especially when the appeal of the broad range of games is considered as well. However, Mattel is very careful to note that there is no guarantee of the introduction of additional peripherals.

Currently, one must regard Intellivision as an extremely promising combination with considerable potential as a home computer. The current price of the Master Component is expected to sell at around $700. One must be impressed with the marketing power and acumen of Mattel Electronics. Yet, such enormous corporations as RCA have retreated from the personal computer market so one might do well to ponder before committing to the current format of Intellivision as one's personal computer choice.

Atari 400/800

The Atari personal computer systems fit nicely into the lower middle and upper levels of under $1,000 price format of this survey. While the console of either the Atari 400 or 800 could be stowed away in a large briefcase, the ever-expanding range of peripherals suggests that the owner of either the 400 or 800 will be devoting increasing time, space, and funds to a complex configuration.

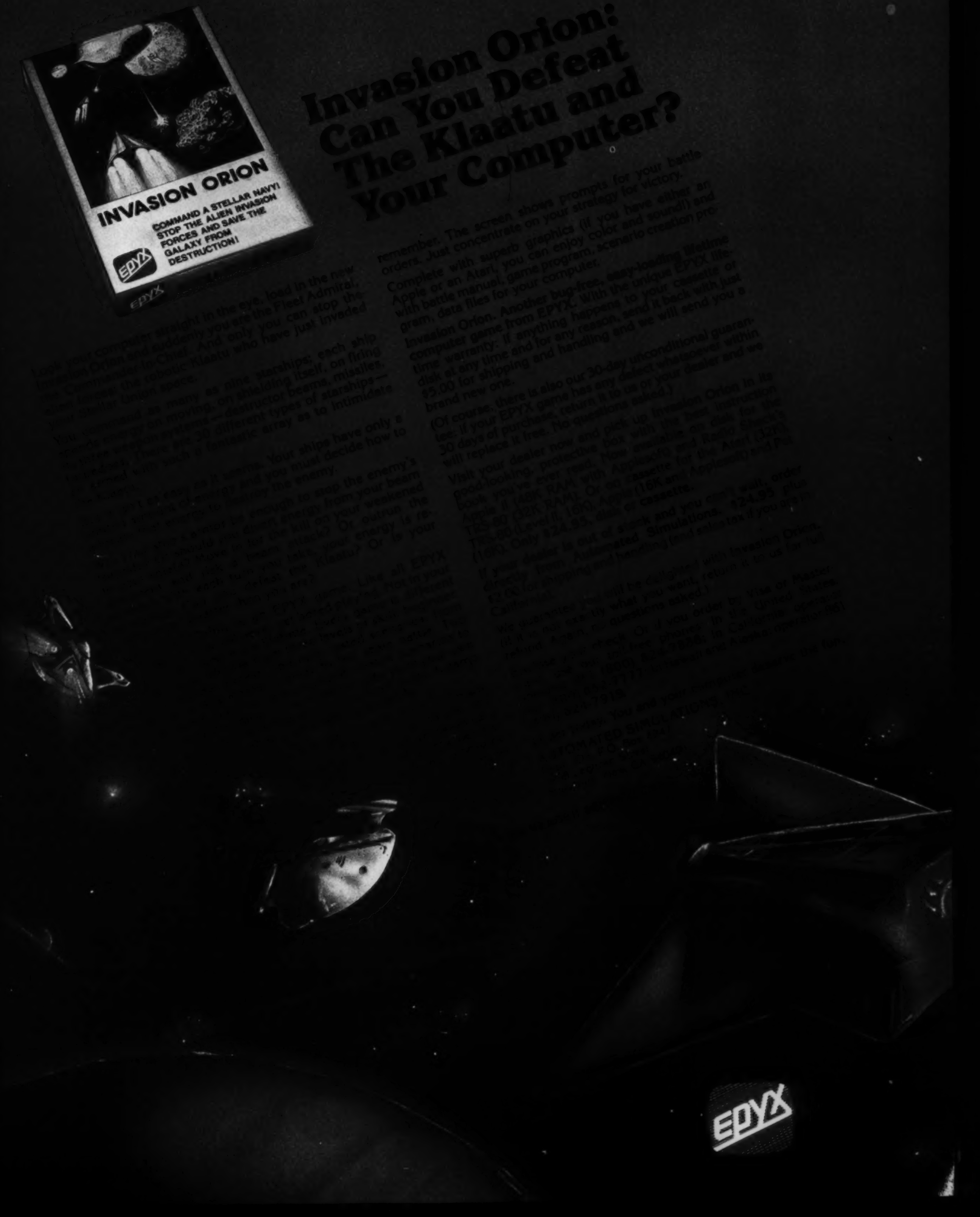
The Atari 400 and 800 share several features including the use of the 6502 microprocessor chip in the CPU. Both have built-in RF modulators and 57-key alphanumeric keyboard (plus four special function keys). The keyboard handles upper and lower case. The 400 offers a flat, touch sensitive keyboard panel which is most attractive in domestic settings since it is child and spill proof. On the Atari 800, the keyboard uses a full stroke typewriter format which allow one's touch typing skills full range.



Atari 800.

It would be churlish not to note that Atari offers a rich range of video games which can be played using either the 400 or 800. Both consoles provide four independent sound synthesizers with an internal speaker. The Atari 400 is very much a computer with 10K of ROM and 8 or 16K of RAM. It is equipped to handle Basic, Assembler, and Pilot.

The Atari 800 can extend its RAM to 48K, and accepts all Atari programs and peripherals. It can control up to four disk drives and a variety of printers. A cursory look at the interface provisions of the 800 makes it clear that it is designed for nontechnical types who do not want to sacrifice any options.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[illegible] ship's armor be enough to stop the enemy's [illegible] should you divert energy from your beam [illegible] Move in for the kill on your weakened [illegible] and risk a beam attack? Or outrun the [illegible] each turn you take, your energy is re[illegible] defeat the Klaatu? Or is your [illegible] how good you are?

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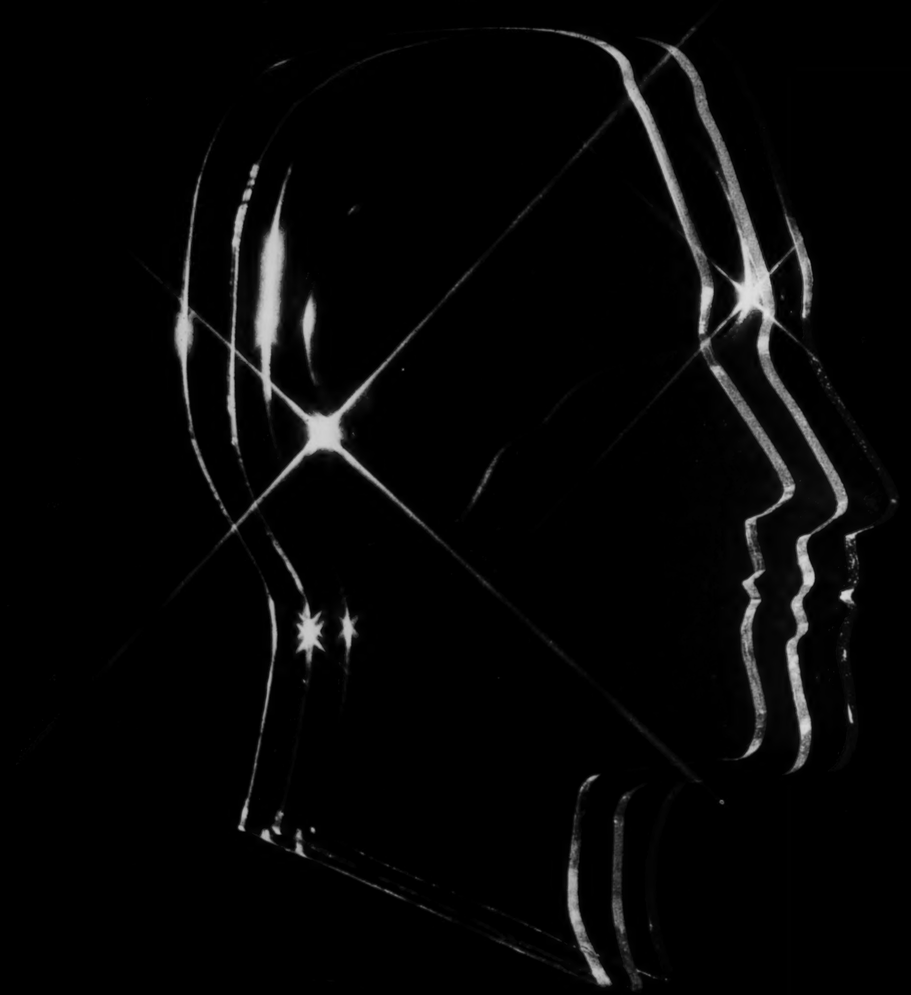

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CIRCLE 291 ON READER SERVICE CARD

Under $1000, continued...

With a list price of $399 the Atari 400 is nicely placed in terms of domestic budgets. With the full 48K of RAM, the Atari 800 lists for $1080 and offers an immediate range of options and support programs which some of the current competition is still developing.

TRS-80 Model III

The TRS-80 Model III is an improved version of the Model I. Unlike the Model I, which has separate keyboard and video display units connected by cables, the Model III is completely enclosed in a plastic case. Other improvements include contoured keys, lower case and special characters.

The unit you can purchase for under $1000—$999, to be exact—includes 16K of memory and Level III Basic. It can be expanded to include two disk drives, 48K of memory, and an RS-232 interface board, which opens the door for a host of peripherals.

The cassette interface on the Model III runs three times faster than the Model I, but also accepts tapes recorded for the Model I, and with a few exceptions most of the programs written for the Model I will run on the Model III. A program on disk must be converted using a conversion utility.

The standard 64 characters per line combine with lower case to give the Model III the potential to be an inexpensive word processor. A line printer and one of many word processing programs will complete the system. The TRS-80 Disk Operating System is one of the best on any microcomputer, with over three dozen commands for controlling system functions and file management, including a Help command to give a summary of each DOS command. The Model III operating system is on floppy disk so that any changes or improvements can be easily distributed by Radio Shack.

The Model III does not offer state-of-the-art graphics or color, but it does have many features in its favor, not the least of which are the vast quantity of software already written for the Model I and the nationwide support network of Radio Shack stores and Computer Centers.

TRS-80 Model III.

NEC PC-8001A

The NEC PC-8001A microcomputer is petite enough to fit under the personal computer umbrella, but to display its crisp graphics with their high resolution, 160 x 100 matrix and choice of 20 or 25 lines of 36 to 80 characters, a monitor is required. This clearly puts the NEC PC-8001A out of the tuck-it-in-your-briefcase class.

NEC PC-8001A.

The NEC PC-8001A uses a PO780c-1 microprocessor chip which is compatible with a Z80A. The standard memory configuration includes 24K of ROM and 32K of RAM. The addition of a PC-8012 I/O unit makes 64K of RAM available. The typewriter-style keyboard has 82 keys including function keys and a numeric keypad. It allows high speed typing for word processing and other professional uses.

One might have minor problems in establishing a warm personal relationship with a machine designated as the PC-8001A. However, NEC has been at pains to make the considerable power of this machine readily accessible to consumers (albeit well-heeled consumers). Moreover, the PC-8001A can run with Microsoft N-Basic, Fortran, Cobol, Pascal, and APL.

The list price of the NEC PC-8001A is $1295 and the addition of a JB-1201M(A) monochrome monitor adds $285 to the price. While many personal computers are such that one can start with packaged games and expand to computer applications and configurations, the NEC begins as a computer which can grow to cover a wide range of professional tasks, word processing, and much more.

With eight colors and a 248-symbol character set to mix with graphics, it is hard to resist the addition of the NEC JC-1202-DH(A) color monitor which displays the crisp visuals in all their precision. NEC's PC-8023A printer will print the full character set bidirectionally at 100 characters per second.

As Japan's most popular computer, the NEC has already accumulated an impressive range of available software and has been at pains to provide suitable orientation manuals for the non-technical minded computer beginner as well.

Apple II Plus

The Apple II Plus points out the broad range of applications now available for personal computers while leaving considerable untapped potential. It is clear that still more may be coaxed out of the 6502 microprocessor chip which serves as the CPU in the Apple II Plus.

While the 18" by 4.5" by 15.5" console is compact enough to be portable, the 11 lb. weight of the console makes the Apple II Plus a bit heavy for frequent portage. The availability of plug-in memory elements allows expansion of RAM in 16K increments up to 64K. Language memory is organized in 2K blocks of ROM with up to 12K possible.

The Apple language library ranges from Applesoft Basic to Apple Pascal, Apple Pilot, and Apple Fortran. Apple provides a full range of peripherals including a graphics tablet, printers, and joysticks. Apple interface cards make it possible to exchange data with other computers, printers, and accessories.

It could be plausibly argued that the range of hardware and software options permits one maximum flexibility in personalizing one's personal computer. If you are not entirely happy with a given Apple feature or option, the features you seek may be available through interface or the growing range of software developed by Apple users.

In the text mode, Apple offers 24 lines of 40 characters with resolution of 140 x 192 in color or 280 x 192 in black and white. Apple provides a portable 12" black and white monitor that will display 40 characters per line with the Apple II Plus.

The $1530 price tag for the Apple II Plus bends the $1,000 price frame considerably. But if one acknowledges that personal computing is a way of life, such a substantial initial investment may be deemed reasonable if not economical.

Apple II Plus.

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ODYSSEY IN TIME

This spectacular adventure game adds a new dimension of excitement and complexity to **Time Traveler.** Players must now compete with the powerful and treacherous adversary in their exacting quest for victory.

To succeed they must vanquish this adversary in combat that rages across 24 time periods.

Odyssey In Time includes all the challenges of Time Traveler plus 10 additional eras, including those of Alexander the Great, Emperor Asoka of India, Attilla the Hun, and Ghengis Khan. Each game is unique, and may be **interupted and saved** for later play.

available for APPLE & TR-80, 32K - $39.95

ALL TIME SUPER STAR BASEBALL & SUPER STAR BASEBALL

ALL TIME SUPER STAR BASEBALL Sample Lineup		SUPER STAR BASEBALL Sample Lineup	
B. Ruth	T. Williams	D. Parker	J. Rice
L. Gehrig	J. Foxx	W. Stargell	H. Aaron
J. DiMaggio	H. Greenberg	W. Mays	L. Brock
J. Jackson	R. Hornsby	P. Rose	R. Carew
G. Sisler	H. Wilson	O. Cepeda	H. Killebrew
S. Musial	B. Terry	C. Yazstremski	R. Allen
T. Cobb	M. Mantle	W. McCovey	R. LeFlore
W. Mays	H. Aaron	R. Jackson	R. Zisk
C. Young P	W. Johnson p	G. Brett	B. Madlock
		R. Guidry P	T. Seaver p

Performance is based on the interaction of actual batting and pitching data. Game can be played by one or two players with the computer acting as a second player when desired. Players select rosters and lineups and exercise strategic choices including hit and run, base stealing, pinch hitting, intentional walk, etc. Highly realistic, there are two versions, ALL TIME SUPER STAR BASEBALL, and SUPER STAR BASEBALL featuring players of the present decade. Each includes about 50 players allowing nearly an infinite number of roster and lineup possibilities.

***Both Games** **$24.95**

TIME TRAVELER

Confronts players with complex decision situations and the demand for real time action. Using the **Time Machine**, players must face a challenging series of environments that include; The Athens of Pericles, Imperial Rome, Nebuchadnezzar's Babylon, Ikhnaton's Egypt, Jerusalem at the time of the crucifixion, The Crusades, Machiavelli's Italy, The French Revolution, The American Revolution, and The English Civil War. Deal with Hitler's Third Reich, Vikings, etc. At the start of each game players may choose a level of difficulty . . . the more difficult, the greater the time pressure. To succeed you must build alliances and struggle with the ruling powers. Each game is unique.

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Perhaps the most fascinating and valuable educational game ever devised — ISAAC NEWTON challenges the players to assemble evidence and discern the underlying "Laws of Nature" that have produced this evidence. ISAAC NEWTON is an inductive game that allows players to intervene actively by proposing experiments to determine if new data conform to the "Laws of Nature" in question. Players may set the level of difficulty from simple to fiendishly complex.

In a classroom setting the instructor may elect to choose "Laws of Nature" in accordance with the complete instruction manual provided.

For insight into some of the basic principles underlying **ISAAC NEWTON** see GODEL, ESCHER, BACH by Douglas R. Hofstadler, Chapter XIX and Martin Gardner's MATHEMATICAL GAMES column in **Scientific American,** October, 1977 and June, 1959. $24.95.

SWORD OF ZEDEK

Fight to overthrow Ra, The Master of Evil. In this incredible adventure game, you must confront a host of creatures, natural and supernatural. To liberate the Kingdom, alliances must be forged and treasures sought. Treachery, deceit and witchcraft must be faced in your struggles as you encounter wolves, dwarves, elves, dragons, bears, owls, orcs, giant bats, trolls, etc. Each of the twelve treasures will enhance your power, by making yor invisible, invulnerable, more eloquent, more skillful in combat, etc., etc., as you explore the realms of geography both on the surface and underground. Dungeons, temples, castles, mountains, etc., are all a part of the fantastic world of Ra. Each game is unique in this spectacular and complex world of fantasy.

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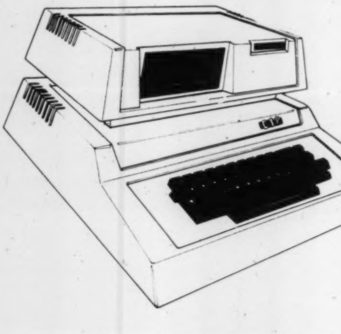
Under $1000, continued...

OSI Challenger 1P

The Ohio Scientific Challenger 1P is a compact and businesslike machine that will interface with joysticks for interludes of frivolity or cut-throat gamesmanship. However, it makes no bones about being a computer machine first and foremost. The Challenger 1P uses a 6502 microprocessor chip for its CPU. The 1P comes with 18K of memory in its standard configuration which can be expanded to 32K.

The Challenger format which includes a disk drive, C1PMF, offers 30K initially which can be expanded to 62K. Both models allow for a very generous mix of I/O devices with up to 48 lines including modems, printers, security, and 10 keypad interfaces. The Challenger 1 uses OSI 6502 Basic from Microsoft. This high level Basic in ROM is equivalent to some of the optional Basics on other personal computers.



Ohio Scientific Challenger 1P.

While one might miss the panache and glossy marketing that makes many personal computers catch the eye, the Challenger focuses on performance, reliability, and sensible pricing. Yet the 1P offers a wide range of video gaming with crisp graphics possibilities for recreation. The Challenger 1P has an effect resolution of 256 x 256 with character display of 24 x 24 or 12 x 48. Sound, music and voice synthesis are possible via a digital-to-analog converter.

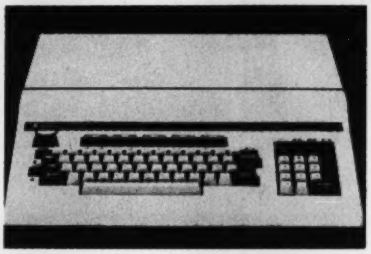
The rear panel of the Challenger 1P is representative of the sensible, functional, and straightforward design of the Challenger line. The video and cassette jacks are grouped on the left. There is a rotary switch located in the center for selecting cassette, printer, and modem. There is a user accessible fuse and an AC switch on the right.

The Challenger 1P began life as an uncased superboard and the latest version offers a standard computer-style, 53-key keyboard with upper and lower case and user programmability. The $479 suggested list price for the 1P can be increased to $1279 price for the C1PMF with dual disk drives and other attractive options.

Hitachi MB-6890

The Hitachi MB-6890 Basic Master Level 3 was discreetly displayed by Hitachi at the summer Consumer Electronics Show in a nicely organized desk which accommodated the monitor, cassette, and printer as well as the keyboard console.

The Hitachi personal computer uses the new 6809 microprocessor as its MPU. It provides 24K of ROM with Basic and Monitor. The initial supply of 32K of RAM can be expanded to 62K on board.



Hitachi MB-6890.

The graphics displayed at the CES were dazzling with 640 x 200 dot resolution and seven colors. The system includes a built-in light pen and the graphics can be keyed through the 59 ASCII type keys with five function keys, 23 numeric and cursor control keys, and upper and lower case.

The current I/O configuration includes a built-in 600 baud cassette, a parallel built-in printer with Anphenol connector, the aforementioned light-pen, and six card edge connectors for expansion. Plans for the introduction of mini floppy and standard floppy disk drives, IEEE-488 and RS-232C interfaces, sound generator, general I/O and Assembler/Editor are projected with the support of solid Japanese Market sales to provide incentive.

One of the inescapable problems in shopping for a personal computer in a period of high technology and fluid markets is the constant introduction of new, more powerful and exciting hardware. The Hitachi personal computer Basic Master Level 3 may serve as a harbinger of the newest generation of personal computers. It is an impressive machine with a projected price of $1500 that pushes the upper limits of our $1,000 guideline rather severely, but is certainly worthy of consideration. □

> *"A computer analysis reveals that children in grades 3 to 9 see the word money more often than love, war more often than peace and car more often than family."*
>
> *American Heritage World Frequency Book*

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2. Peripherals

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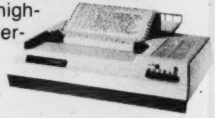

3. Software

Word processing, includes reliable, easy-to-use Zenith Electronic Typing and powerful, full-featured WORDSTAR.

Small Business Programs, feature General Ledger and Inventory Control.

HUG, Heath Users' Group, offers members a library of over 500 low-cost programs for home, work or play.

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For your own custom programs, Microsoft languages are available in BASIC (compiler and interpreter), FORTRAN and COBOL.

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Three versatile systems give you the capability to perform your specific tasks.

CP/M by Digital Research makes your system compatible with thousands of popular CP/M programs.

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Expand the performance range of your computer with a broad selection of utility tools, including the best of *Digital Research* and the complete line of innovative *Softstuff* products.

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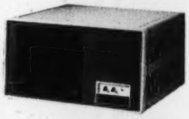
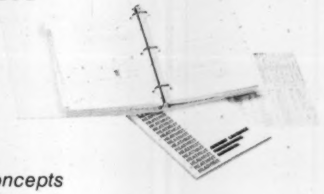


The 8-inch Heath/Zenith 47 Dual Disk System adds over 2 megabytes of storage to your 89 Computer. Diskettes are standard IBM 3740 format, double-sided, double-density.

The 5¼-inch 87 Dual Disk System adds 200K bytes of storage to your 89. Both disk systems feature read/write protection and easy plug-in adaptability.

8. Self-Study Courses



Learn at your own pace with *Programming Courses* that teach you to write and run your own programs in Assembly, BASIC, Pascal or COBOL.

A course on *Computer Concepts for Small Business* gives you the understanding to evaluate the ways a computer can benefit your business.

Personal Computing is a complete introduction to the fundamentals for the novice. Every Heathkit/Zenith course is professionally designed for easy, step-by-step learning.

All Heath/Zenith Computer Products are available completely assembled and tested for commercial use. Or in easy-to-build, money-saving kits.

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Communicate with the outside world through a *Three-port EIA RS-232C Serial Interface.*

Expand RAM to 64K with easy-to-install *expansion chips.*

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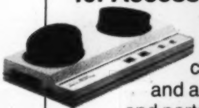

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No one stands by you like Heath/Zenith. We help you get your system up and running smoothly. Service is available from trained technicians, over the phone or at one of 56 Heathkit Electronic Centers.

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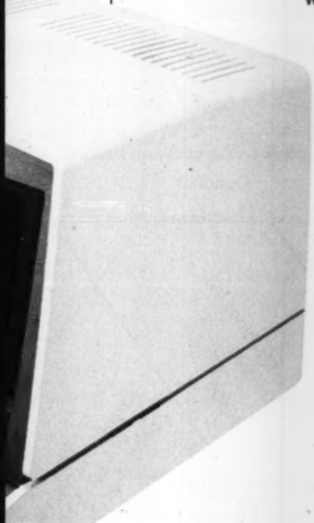

All at your Heathkit Electronic Center

Pick the store nearest you from the list at right. And stop in today for a demonstration of the Heath/Zenith 89 Computer System. If you can't get to a store, send $1.00 for the latest Heathkit® Catalog and the new Zenith Data Systems Catalog of assembled commercial computers. Write to Heath Co., Dept. 335-814, Benton Harbor, MI 49022.

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CPU/MPU	6502	Z-80	6809-2	6502A
ROM	10K	12K	8K	16K
RAM	8K	16K	4K	5K
Maximum RAM	32K	48K	32K	32K
Keyboard	53-key Standard	65-key	53-key Standard	Full Typewriter
Languages	Basic	Basic	Basic, Extended Basic	Basic, 6502 machine language
Screen Display	24x24 or 12x48	16x64	32x16	22x23
Graphic Resolution	256x256 pixels	128x48 pixels	64x32 up to 256x192 pixels	176x184 pixels
Color	No	No	Yes	Yes
Sound	Digital-to- Analog	Through cassette port with ext. amp.	256 tones	1 Sound Generator
Game Controls	Optional	No	Yes	Optional
Address	Ohio Scientific 1333 South Chillicothe Rd. Aurora, OH 44202	Radio Shack 1300 One Tandy Center Fort Worth, TX 76102		Commodore Business Machines Inc. Computer Systems Division 681 Moore Rd. King of Prussia, PA 19406

A Comparison Chart

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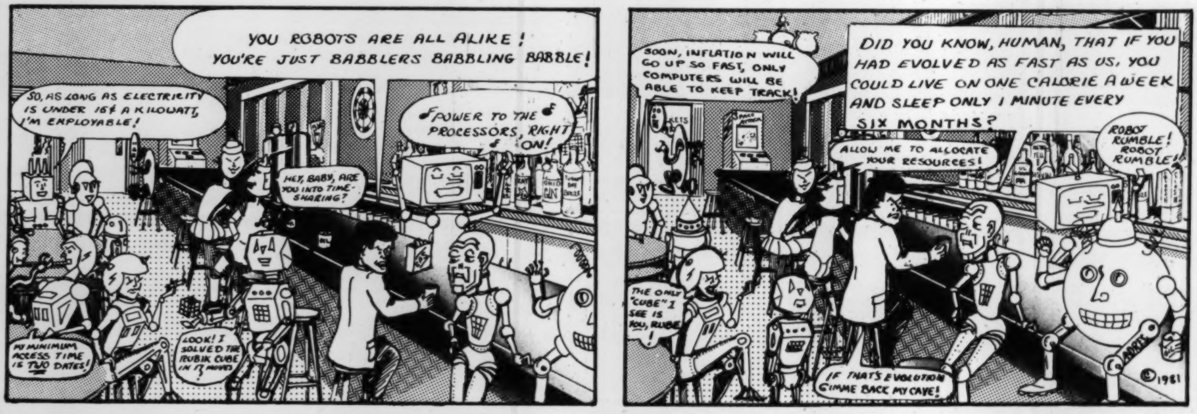
	$1295	$525	$1530	$389	$789
	PO 780C-1 (Z-80A compatible)	9900 Family 16-bit	6502	6502	6502
	24K	26K	16K	10K	10K
	32K	16K	16K	8K	16K
	48K	72K	64K	32K	48K
	82-key	Standard (99/4-calculator type)	Standard	57-key Touch-sensitive	57-key Standard
	Basic, Fortran, Pascal, APL	Basic, Extended Basic	Basic, Pascal, Pilot, 6502	Basic, Pilot, Assembler	Basic, Pilot, Assembler
	20 or 25x36, 40, 72, or 80	24x32	24x40	24x40	24x40
	160x100 pixels	192x256 pixels	280x192 pixels	320x192 pixels	320x192 pixels
	Yes	Yes	Yes	Yes	Yes
	Yes	5 octaves, 3 tones and white noise	Built-in speaker	4 synthesizers, 4 octaves	4 synthesizers, 4 octaves
	No	Optional	Optional	Optional	Optional
	NEC America Inc. 1401 Estes Ave. Elk Grove, IL 60007	Texas Instruments Inc. Personal Computer Division P.O. Box 53 Lubbock, TX 79408	Apple Computer Inc. 10260 Bandley Dr. Cupertino, CA 95014	Atari Computer Division P.O. Box 427 Sunnyvale, CA 94086	

	Sinclair ZX80	Mattel Intellivision	APF Imagination Machine I	Hitachi MB-6890
Price	$199.95	Master Component-$300 Keyboard Component-$700	$599	$1500
CPU/MPU	Z80A	GI 16-bit	6800	6809
ROM	4K	7K	10K	24K
RAM	1K	16K	9K	32K
Maximum RAM	16K	64K	32K	66K
Keyboard	40-key Touch-sensitive	60-key Standard	53-key Standard	59-key ASCII Standard
Languages	Basic	Basic	Basic and Machine Language	Extended Basic
Screen Display	23x32	24x40	32x16	25x40 or 80
Graphic Resolution	64x46 pixels	160x192 pixels	128x192 pixels	640x200 pixels
Color	No	Yes	Yes	Yes
Sound	No	3 voices	1 voice	Yes
Game Controls	No	Yes	Yes	Optional
Address	Sinclair Research Ltd. 50 Staniford St. Boston, MA 02114	Mattel Inc. 5150 W. Rosecrans Ave. Hawthorne, CA 90250	APF Electronics 444 Madison Ave. New York, NY 10022	Hitachi Sales Corp. of America 401 W. Artesia Blvd. Compton, CA 90220

Bit Pit

Chas Andres


YOU ROBOTS ARE ALL ALIKE! YOU'RE JUST BABBLERS BABBLING BABBLE!
SO, AS LONG AS ELECTRICITY IS UNDER 16¢ A KILOWATT, I'M EMPLOYABLE!
POWER TO THE PROCESSORS, RIGHT ON!
HEY, BABY, ARE YOU INTO TIME-SHARING?
MY MINIMUM ACCESS TIME IS TWO DATES!
LOOK! I SOLVED THE RUBIK CUBE IN 17 MOVES
SOON, INFLATION WILL GO UP SO FAST, ONLY COMPUTERS WILL BE ABLE TO KEEP TRACK!
DID YOU KNOW, HUMAN, THAT IF YOU HAD EVOLVED AS FAST AS US, YOU COULD LIVE ON ONE CALORIE A WEEK AND SLEEP ONLY 1 MINUTE EVERY SIX MONTHS?
ALLOW ME TO ALLOCATE YOUR RESOURCES!
ROBOT RUMBLE! ROBOT RUMBLE!
THE ONLY "CUBE" I SEE IS YOU, RUBE!
IF THAT'S EVOLUTION GIMME BACK MY CAVE!
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To celebrate our daughter Melody's second birthday, we are offering one of the best games we've seen anywhere at a special price. **DYNACOMP,** maker of exceptionally fine computer software, makes a game called **HODGE PODGE** for children ranging from under two years old to primary grades. Children learn the letters of the alphabet, words, numbers, musical scales, songs and animals. The child presses any key on the keyboard and something happens. For example, when "D" is pressed, a dog appears who frowns when a bathtub comes into sight – all to the tune of "Oh Where Has My Little Dog Gone." Our Melody loves it and jumps up and down in excitement when she plays it. It's a chance for her to finally get at the computer after watching Mommy and Daddy use it all day. It's the only program we know of for children that young. It runs on the Apple II* plus (Applesoft*) and needs 48K plus a disk drive. It lists for $23.95 but if you say "Happy Birthday Melody" you can have it for $18.99. We know you'll like it. We think it's fantastic.

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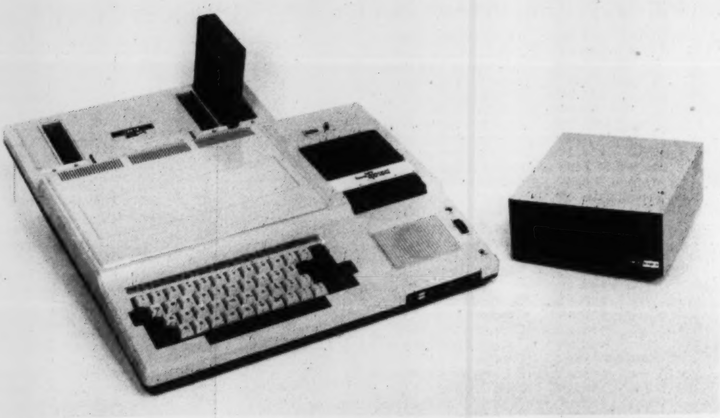
CIRCLE 144 ON READER SERVICE CARD

David H. Ahl

APF Imagination Machine II



In 1978, APF Electronics, caught up in the video game craze, introduced the MP-1000. Like the Atari Video Computer System, the MP-1000 accepted plug-in cartridges of various games. Almost with one voice, most of the video game manufacturers a year later announced add-on keyboard units to make their video games into "real computers." Some of these were produced on schedule (almost), some were produced late (very), and most just quietly faded away. APF was in the first group having produced a keyboard unit almost on schedule. We salute them.

The keyboard/game unit combination is now available in a combined unit as the Imagination Machine I.

At the 1981 Winter CES, APF introduced an integrated version of the Imagination Machine (IM) aimed more at the small business market called the Imagination Machine II. First shipments were made in May 1981. Marty Lipper confided to me that consumer and dealer reception has been quite enthusiastic in Europe, hence APF is filling that pipeline first.

Using the Imagination Machine II

I had an opportunity to use an Imagination Machine II at the Summer CES in June. While this is not an in-depth evaluation, it will provide some idea of the capabilities of the IM II.

The IM II, unlike other popular computers, is built around the 6800 mpu. While SWTPC, Gimix and Midwest Scientific owners swear by the 6800, it has never caught on in a mass market machine. Perhaps more significant, Microsoft has not written a Basic for the 6800.

The basic IM II unit houses the processor, 53-key full-stroke keyboard, dual-track cassette recorder (one track digital information, one track audio) and interface electronics for disk drives and a printer.

The IM II drives a monitor or color TV set. The display is 32 characters wide by 16 lines. There are 70 screen codes: 26 upper case letters, 10 numerals, 28 symbols and 16 graphics characters. The graphics characters divide each screen location into four elements thus, according to current convention, the screen resolution is (32 x 2) x (16 x 2) = 2048 pixels, a new low on the graphics totem pole. On the other hand, machine language access to print graphics is possible which gives the user the ability to manipulate 256 x 192 points (49,152 pixels) albeit with much less ease than low resolution shapes.

Although resolution is low, the graphics are easy to use. APF Level I Basic has PLOT, HLIN and VLIN commands. To put Shape 9 (a 2 x 2 checkerboard) at the center of the screen (X=15, Y=7) requires only the following simple command sequence:

```
SHAPE=9
PLOT 15,7
```

To color the shape any of seven colors, it is necessary to add a single line. For example, to color the shape red, type:

```
COLOR=3
```

However, to make it even easier to use colored shapes, screen codes from 128 to 255 represent each of the 16 shapes in each of the eight colors. Hence, a dark blue checkerboard would appear at the bottom right of the screen given the following commands:

```
SHAPE=169
PLOT 31,15
```

To plot a line of checkerboards across the center row (15) of the screen, one need only type:

```
SHAPE=9
HLIN 0, 31, 7
```

which draws a horizontal line (HLN) from X=0 to X=31 at Row Y(7). VLIN does the same for vertical lines.

The IM II has a one-voice music box built in with a three octave range. No complicated POKE commands are needed. Music is simply produced with the com-

	APF Imagination Machine II	*Osborne I*	*Apple II*
Price	$1600	$1795	$1995
User Memory	27K RAM	64K RAM	32K RAM
Disk Drives	2 5-1/4"	2 5-1/4"	1 5-1/4"
Cassette	Built-in	No	Optional
Keyboard	53-key	53-key plus numeric keypad	50-key
Display	32 characters x 16 lines	50 characters x 50 lines	40 characters x 24 lines
	Upper case	Upper & lower	Upper case
Operating System	APF	CP/M	Apple DOS

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It's a Sure Shot.

When it comes to Apples, take your cue from Vista's A800 Eight-Inch Floppy Disk Controller. The A800 offers a cost-efficient approach to software compatible disk memory expansion for your Apple II© computer. The A800 Controller enables Apple II users to access up to five megabytes of online storage through conventional disk operating (DOS) commands.

The Control and DMA Logic provides high speed (1 microsecond per byte) transfer of data from the disk drive directly to the Apple II memory without processor intervention. Plus, the Phase-Locked Loop Data Separator provides the ultimate in data reliability.

AND THERE'S MORE.

The controller is compatible with the most popular disk operating systems for the Apple II computer. It also interfaces to all Shugart/ANSI Standard Eight-Inch Floppy Disk Drives. The A800 provides complete IBM format compatibility in both single and double-density modes.

THE HOT SHOT AT A COOL PRICE.

The A800 is reasonably priced at $595. A price you can't beat when you compare its quality and performance.

CALL YOUR SHOTS.

Vista offers you a complete line of peripheral equipment to maximize the capabilities of your Apple system including: High capacity Mini-floppy Disk Drives, the Vista Music Machine 9 and the Vista Model 150 Type Ahead Buffer. In addition, Vista offers a line of advanced components fully compatible with the TRS-80* and S-100 based computers.

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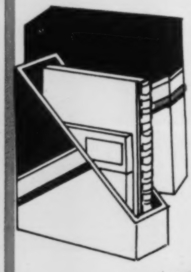
Requires Apple II, Disk, Communications.



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CIRCLE 319 ON READER SERVICE CARD

Imagination Machine, continued...

mand MUSIC "nnn" in which nnn represents a series of notes represented by numbers. Duration is indicated by the number of 0's following a note value. Sharps and flats may be indicated with + and - symbols. Here are the first two bars of Haydn's Symphony #94 (second movement) with which I may have driven everyone batty at APF's press reception at Summer CES:

```
MUSIC"10 10 30 30 50 50 3000
  40 40 20 20 /70 /70 /500000"
```

Another major screen and print feature is the PRINT USING command which allows the user to print numbers or strings in a specified format (leading dollar sign, two decimal places, etc.).

Another handy print feature is the ability to specify the line printer with the statement PRINT=1. To print on the screen, PRINT=0. This seems more flexible than the LPRINT command in other Basics. To list a program on the line printer one need only type in immediate mode: PRINT=1 and LIST.

Other features of APF Basic include an EDIT statement which allows the user to change a portion of a line in a Basic program. PEEK and POKE allow examination and alteration of values in memory. Several built-in machine language routines may be accessed by means of CALL statements, for example, CALL 17046 clears the screen to black while CALL 17026 creates a combination whistle/beep.

What else? The usual statements and commands, but not the expected functions. No log. No exp. No trig functions. APF Basic has a range of ±999,999,999.9999. Plenty of accuracy for most small business applications but for scientific applications a far cry from floating point variables to 10^{38} found on most small computers these days.

Software? For starters APF announced an impressive array of software for the Imagination Machine. There are eight educational cassettes, eight personal and home management cassettes, seven business disks, and one game cassette (on the IM I you can, of course, use the eighteen game cartridges that run on the MP-1000 game machine. These will not run on the IM II). In addition to these, another company, AVAS, is offering a line of forty-six educational cassettes. They are a bit pricey, ranging from $33.95 to $83.50 each. Since we have seen virtually none of the software, we cannot draw any conclusions as to its quality at this time.

Price—The Good News

Imagination Machine II includes the proccessor/keyboard/cassette unit with 27K memory, floppy disk and printer interface, dual 5-1/4" floppy disk drive, cables and manuals. The price is an unbelievably low $1599.95. We usually like to position new products between others on the market but nobody, just nobody has a dual floppy system under $1600.

The worries: at the moment there is just one second source software vendor and others are not on the horizon. So today, this puts the burden squarely on APF. One of the announced business software packages has been released. But even when the rest come out, APF will still have to attract other second source vendors to produce compatible software.

Reliability and manufacturer service? Too soon to tell. APF is a major vendor of handheld and printing calculators so they are not novices in the market. But as we all know, computers are different animals. Can their dealers service them? Only time will tell.

In summary, although competent in some dimensions, we're not ecstatic about IM II Basic, we worry about software availability, and reliability and servicability are unknowns. On the other hand, for $1600 it's the price leader in hardware and features. We don't usually look to APF to establish milestones, however, with the IM II, they might just have done so.

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Plug and go. The SoftCard system starts with a Z-80 based circuit card. Just plug it into any slot (except 0) of your Apple. No modifications required. SoftCard supports most of your Apple peripherals, and, in 6502-mode, your Apple is still your Apple.

CP/M for your Apple. You get CP/M on disk with the SoftCard package. It's a powerful and simple-to-use operating system. It supports more software than any other microcomputer operating system. And that's the key to the versatility of the SoftCard/Apple.

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BASIC included. A powerful tool, BASIC-80 is included in the SoftCard package. Running under CP/M, ANSI Standard BASIC-80 is the most powerful microcomputer BASIC available. It includes extensive disk I/O statements, error trapping, integer variables, 16-digit precision, extensive EDIT commands and string functions, high and low-res Apple graphics, PRINT USING, CHAIN and COMMON, plus many additional commands. And, it's a BASIC you can compile with Microsoft's BASIC Compiler.

More languages. With SoftCard and CP/M, you can add Microsoft's ANSI Standard COBOL, and FORTRAN, or Basic Compiler and Assembly Language Development System. All, more powerful tools for your Apple.

Seeing is believing. See the SoftCard in operation at your Microsoft or Apple dealer. We think you'll agree that the SoftCard turns your Apple into the world's most versatile personal computer.

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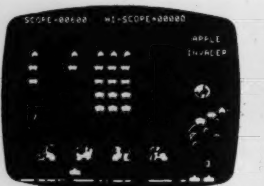
Super Invasion and Space War

Disk CS-4508 $29.95
Requires 48K Apple II or Apple II Plus



Super Invasion

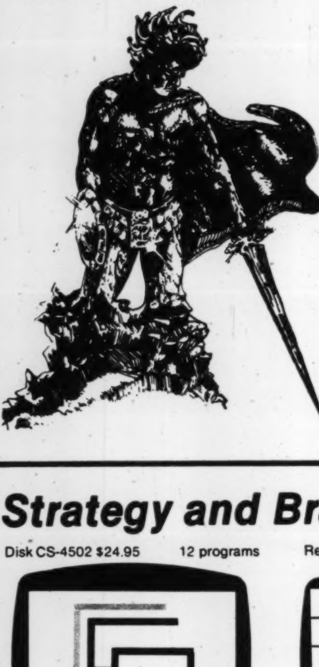
This original invasion game features superb high resolution graphics, nail biting tension and hilarious antics by the moon creatures. Fifty-five aliens whiz across the screen, quickening their descent, challenging you to come out from behind your blockades and pick them off with your lasers. A self-running "attract mode" makes it easy to learn and demonstrate the game. Game paddles are required.

Space War

Take command in Space War. Select from five game modes, including reverse gravity, and the battle begins. Challenge your opponent with missle fire, force him to collide with the sun or to explode upon re-entry from hyperspace. Be wary. . . He may circle out of sight and re-appear on the opposite side of the galaxy. (This is the classic MIT game redisgned especially for the Apple.)

3 Adventures

Disk CS-4513 $39.95
Requires 48K Apple II or Apple II Plus



Adventureland (by Scott Adams) You'll encounter wild animals, dwarfs and many other puzzles and perils as you wander through an enchanted world, trying to rescue the 13 lost treasures. Can you rescue the Blue Ox from the quicksand? Or find your way out of the maze of pits? Happy Adventuring!

Pirate Adventure (by Scott Adams)— "Yo Ho Ho and a bottle of rum. . . " You'll meet up with the pirate and his daffy bird along with many strange sights as you attempt to go from your London flat to Treasure Island. Can you recover Long John Silver's lost treasures? Happy sailing matey. .

Mission Impossible Adventure (by Scott Adams)— Good Morning, Your mission is to. . . and so it starts. Will you be able to complete your mission in time? Or is the world's first automated nuclear reactor doomed? This one's well named, its hard, there is no magic but plenty of **suspense**.

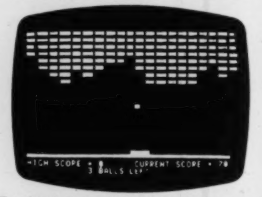
Good Luck . . .

Space and Sports Games

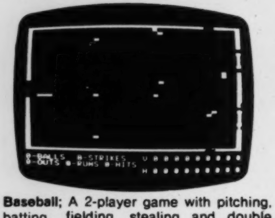
Disk CS-4501 $24.95 8 programs Requires 32k Apple II or Apple II Plus

TIME 83
SCORE 0
AMMO 25
MAY THE FORCE BE WITH YOU

Star Wars. Shoot down as many TIE fighters as possible in 90 seconds.



Breakout. Four skill levels and improved scoring make this the best breakout ever.



Baseball; A 2-player game with pitching, batting, fielding, stealing and double plays.

Saucer Invasion. Fire missles to destroy the invaders who fly at different speeds and altitudes.

Rocket Pilot. Maneuver your spaceship over the mountain using horizontal and vertical thrusters.

Torpedo Alley. Sink as many warships as possible in 2 minutes.

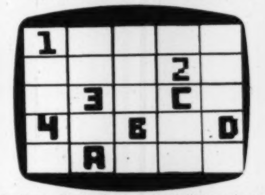
Darts. Use game paddles to control the throw of 6 darts.

Dynamic Bouncer. A colorful, ever-changing graphics demonstration.

Strategy and Brain Games

Disk CS-4502 $24.95 12 programs Requires 32K Apple II or Apple II Plus

Blockade. Build a wall to trap your opponent, but don't hit anything.



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16
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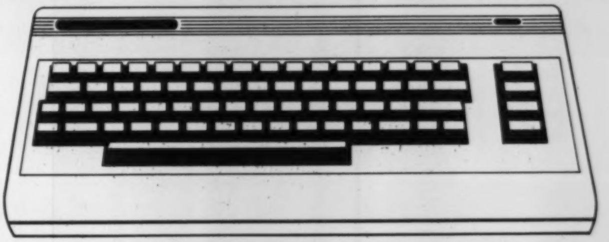

Commodore VIC-20 Personal Computer

David H. Ahl

The VIC-20 was formally announced on January 8, 1981 at the Winter Consumer Electronics Show. It was promised that it would be on sale in quantity by March 1981. However, we have learned from previous experience to take such announcements with a grain of salt. It was not until the National Computer Conference in May that we were able to pick up an "advance" VIC-20. However, by the time you read this, production units should be reaching retail stores.

Which retail stores we are not quite sure. Commodore has been making a good deal of news lately in the trade press by first rescinding and then reinstating distributorship agreements with various personal computer distributors in the U.S. Some months ago, Commodore announced its intention to go 100% to company-owned stores, however, they seem to have backed off this position and so you may well find the VIC available in both Commodore stores as well as other retail computer outlets.

Commodore also has made news in the trade press by having virtually a 100% turnover of its key people twice in the last year. The last announcement of new people in key positions was accompanied by an announcement that the company headquarters would move from Sunnyvale, California to King of Prussia, Pennsylvania. Perhaps now that the company is headquartered in a suburb of the city of brotherly love we will see somewhat more harmony in its ranks.

Commodore is positioning the VIC as a "friendly computer" and everyone on the product team as well as the manuals and dealer documentation seem to be in support of this philosophy.

From a price standpoint, at a suggested retail of $299.95, the VIC-20 falls in the group that would include the Sinclair ZX-80 and ZX-81 (under $200), the Radio Shack TRS-80 Color Computer ($399), and the Atari 400 ($399).

Comparing the VIC to those three units, it is quickly apparent that the key differences are in memory, keyboard and graphics. As shown in Table 1 the Sinclair comes with only 1K bytes of memory while the Atari comes with 16K bytes; the VIC and TRS-80 Color fall in between with 5K and 4K bytes respectively. Of the four, the VIC is the only one that is expandable to 32K, although with second source memory the Atari also is expandable to 32K.

The VIC-20 has sixty-one full stroke keys and four function keys, considerably more than any of its competitors. Furthermore, the Sinclair and Atari 400 have flat membrane keyboards which have not exactly found universal acceptance among people who are use to a typewriter style keyboard. In terms of character and graphics resolution, except for the Sinclair with its monochrome display, the Commodore VIC trails the pack. Ah well, "you pays your money and you takes your choice."

Hardware

The VIC-20 is built around the 6502A microprocessor, the same unit used in the Pet, Atari, and Apple computers.

The keyboard is one of the most interesting features of the VIC. It has two modes of operation: Graphics Mode and Text Mode. In Graphics Mode all of the keys produce upper case letters and when shifted, produce the graphics symbol on the right side of the base of the key (see figure 1). In Text Mode each key will type both upper and lower case but, in addition, produce the graphics on the left side of the key. These are the graphics which are most suited for charts, graphs and business forms and would most likely be used with text.

The VIC supposedly has 255 different combinations of screen and border colors, including sixteen screen colors and eighteen border colors. Unfortunately, on the two color TV sets on which we tried the computer, no matter what we did with the color tuning on the sets, the most we could distinguish were six border and six background colors. We suggest that VIC owners try the unit on their own TV and then use those colors which can be most easily distinguished from one another rather than blithely follow the manual.

Two very handy keys (and POKE functions) are those which let you type reverse characters on the screen (for instance white on black instead of black on white). One key turns reverse on and the other turns reverse off. Also very handy are the four function keys (eight if you shift them) which may be assigned any basic command or instruction set under program control. Tektronix, Wang and HP computers have used function keys for years, but this is the first time we have seen them on a unit in this price range.

The VIC also has three tone generators, each with a range of three octaves and a

	Sinclair ZX81	**Commodore VIC-20**	**Atari 400**	**TRS-80 Color**
Price	$150 est.	$300	$400	$400
Included RAM	1K	5K	16K	4K
Maximum RAM	16K	32K	16K	32K
Keyboard	40-key Flat	61-key Full stroke	57-key Flat	53-key Full stroke
Screen Display	32 x 16 (512 char)	22 x 23 (506 char)	24 x 40 (960 char)	32 x 16 (512 char)
Graphics	128 x 64 (8,192 pixels)	176 x 184 (32,384 pixels)	320 x 192 (61,440 pixels)	256 x 192 (49,152 pixels)

The VIC comes with keyboard unit, power supply, RF modulator and cables.

When all else fails, it's time to open the manual.

fourth white noise generator useful for making airplane sounds, explosions and the like. Each of the three tone generators has a different three octave range so you might want to think of them, as the manual does, as tenor, alto and soprano. The tone generators are called by means of POKE statements, for example, POKE 36875,225 produces a middle C in the tenor voice. Actually the easiest way to program music is to store the notes and durations in data statements and write a short routine to call the data and play the song or melody. The guide that comes with the VIC-20 includes twenty sound routines such as laser beam, high-low siren, birds chirping, running feet, door opening, and explosion.

Peripherals

We are promised no less than fifteen peripherals and add-ons for the VIC-20 which "will be introduced through out 1981." The one we would like to see the most, and we suspect most VIC owners will want the soonest, is a device for storing programs—either a tape or disk unit. We are promised a low-priced cassette player as well as a low-priced single floppy disk unit. Unfortunately promises and delivery are two different things. Unlike the other computers in its class, you cannot plug a standard tape recorder into a set of jacks on the VIC. Instead of a set of jacks the VIC has an edge connector which takes a special type of jack to connect it to a tape recorder. Both the user guide and Commodore newsletter describe the use of the cassette tape recorder which suggests there are at least a few prototype units in existence. Hence we probably can expect to see this device on the market fairly shortly.

In addition to the tape recorder edge connector, the VIC has five other connectors for external devices. They include a nine-pin socket for game I/O devices such as joystick, light pens or potentiometers; a memory expansion connector; an audio/video connector which plugs into the included RF modulator; a serial I/O connector which will be used with a disk drive; and a user port.

Software

The software on the VIC is effectively the same as that found on Pet/CBM systems. The main difference is that VIC programs written on the Pet must conform to the VIC's 22-character screen width and, of course, cannot exceed the available memory. Pet lines longer than 22 characters will "wrap" around and not produce the same image on the VIC. Furthermore, the VIC has available various color and sound features which are not available on the monochrome and silent Pet. What we are saying then is that the VIC software is not new but rather it is the same excellent Basic which has been around and available on the Pet for several years. It has a range of floating point variables from -10^{38} to 10^{38}, integer variables from -32768 to 32767 and string variables which may be up to 255 characters in length. It has the usual arithmetic comparison and boolean (and, or, not) operators.

It has all of the usual commands and statements, including a set to read and write from data files. It has an impressive array of functions including arc tangent, LEFT$ (X$,X), RIGHT$ (X$,X), SPC (which in a print statement skips X spaces forward, and POS (which returns the number of the column which the next print statement will begin on the screen).

QUALITY ASSURANCE DEPT
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"We've completed the preliminary tests on your new computer."

Most basic keywords may be abbreviated to two letters although these are all letter and shift/letter combinations so it is really three keystrokes. For short, three-letter basic keywords this is rarely a saving. However, the print statement is abbreviated to simply a shift/? which is most decidedly a saving. Although using these abbreviations gives the program a very strange look on the screen because the letter and shift/letter are printed as a letter and graphic character, when a program is listed the computer will automatically spell out all of the Basic words.

In VIC Basic there are no separate graphics commands as are found in Atari and Apple systems. Rather the POKE command is used to put a graphics character in a designated location on the video display. For example, if you want to put a ball in the center of the screen you would type the command POKE 7910,81. Screen locations vary from 7680 in the upper left hand corner to 8185 in the bottom right hand corner. The screen is divided into 23 horizontal rows of 22 characters each. How then can we get a resolution of over 32,000 pixels as shown in Table 1? This is obtained because each character is considered to be divided into a subset of eight smaller characters because of the extensive graphic character set. Purists may take issue with this approach because there is really no way of addressing 176 x 184 pixels. The addressing is limited to 22 x 23 characters. However, within each of those characters there are graphics characters for drawing, for example, a horizontal or vertical line at four different positions, thus dividing the characters into eight subsegments. I don't think anyone will argue with the statement that the Pet can produce outstanding graphics using this same approach. As mentioned earlier, music and sound is also produced by means of POKE statements.

SOFTWARE FOR THE SORCERER*

VISI-WORD by Lee Anders
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GBS
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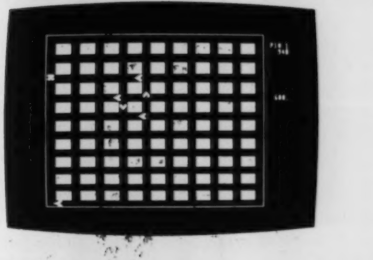
by Lee Anders
GBS is a general purpose system that can be used for many business applications. Use this system to enter, edit, format, and print information. You may delete, insert, or append records, and then summarize and tabulate the results. You design, in just a few minutes with the aid of GBS, a system of records. Then use the power of GBS to compute, sort, select, merge, add, or modify your data, all at machine language speed. GBS will provide you with the kind of fast, accurate, flexible tools you always knew a home computer could provide. Four example application programs are included: inventory control, accounts receivable, payroll, and check register. Of course, you don't have to use GBS for business. You can use it for personal finance, club or personal record keeping, or almost any type of problem that involves the management of records. Written in machine language. Includes an extensive user manual. Requires a Sorcerer with at least 32K of memory. **$99.95**

FORTH for the Sorcerer. Now Sorcerer owners can enjoy the convenience and speed of the fascinating FORTH programming language. Based on fig-FORTH and adapted for the Sorcerer by James Albanese, this version uses simulated disk memory in RAM and does not require a disk drive. Added to standard fig-FORTH are an on-screen editor, a serial RS-232 driver, and a tape save and load capability. Numerous examples are included in the 130 pages of documentation. Requires 32K or more of RAM. **$59.95**

QS SMART TERMINAL by Bob Pierce. Convert your Sorcerer to a smart terminal. Used with a modem, this program provides the capability for you to communicate efficiently and save connect time with larger computers and other microcomputers. The program formats incoming data from time-sharing systems such as The Source for the Sorcerer video. Incoming data can be stored (downloaded) into a file in RAM. Files, including programs, may be saved to or loaded from cassette, listed on the video, transmitted out through your modem, or edited with an on-board text editor. Interfaces with BASIC and the Word Processor Pac. **$49.95**

DPX™ (Development Pac Extension) by Don Ursem. Serious Z80 program developers will find this utility program to be invaluable. Move the line pointer upward. Locate a word or symbol. Change a character string wherever it occurs. Simple commands allow you to jump directly from EDIT to MONITOR or DDT80 modes and automatically set up the I/O you want for listings. Built-in serial driver. Stop and restart listings. Abort assembly with the ESC key. Save backup files on tape at 1200 baud. Load and merge files from tape by file name. Versions for 8K, 16K, 32K, and 48K Sorcerer all on one cassette. Requires the Sorcerer's Development Pac. **$29.95**



ARROWS AND ALLEYS™ by Vic Tolomei
The latest of Quality Software's great arcade games for the Sorcerer is ARROWS AND ALLEYS, by Vic Tolomei. You drive your car in a maze of alleys. Your task is to eliminate a gang of arrows that constantly pursues you. You have a gun and the arrows don't, but the arrows are smart and they try to stay out of your sights and will often attack from the side or from behind. Eliminate the arrows and another, faster gang comes after you. Four levels of play. Requires 16K or more of RAM. **$17.95**

GRAPHICS ANIMATION by Lee Anders. This package provides the BASIC programmer with a powerful set of commands for graphics and animation. The program is written in machine language but is loaded together with your BASIC program and graphics definitions with a CLOAD command. Any image from a character to a large graphic shape may be plotted, moved, or erased with simple BASIC commands. Encounters of plotted character sets with background characters are detected and background images are preserved. Contains a medium resolution plotting routine. A keyboard routine detects key presses without carriage returns. Includes a separate program for constructing images. Runs on any size Sorcerer. **$29.95**

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BEDIT by Ernest Bergmann. A BASIC editor. This short and easy to use program is a machine language routine that loads in low memory and allows you to edit your BASIC programs by modifying text on the video screen. No more retyping a long line just to change one character. A few cursor movements make the necessary modifications. Even renumbering lines is easy to do. This program is a real timesaver. Runs on any size Sorcerer. **$11.95**

Z80 DISASSEMBLER by Vic Tolomei. Decode machine language programs with this easy to use disassembler written in BASIC. Also works as an ASCII dumper. **$14.95**

SOFTWARE INTERNALS MANUAL FOR THE SORCERER by Vic Tolomei. A must for anyone writing software for the SORCERER. Seven chapters: Intro to Machine Language, Devices & Ports, The Monitor, Cassette Interface, BASIC structure, Video & Graphics, The Keyboard. Indexed. Includes diagrams and software routines. 64 pages. **$14.95**

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FASTGAMMON™ by Bob Christiansen. Backgammon players love this machine language program that provides a fast, skillful opponent. Option to replay a game with the same dice rolls. Eight-page instruction manual includes rules of backgammon. **$19.95**

TANK TRAP by Don Ursem. An action game that combines skill, strategy, and luck. A rampaging tank tries to run you down. You are a combat engineer, building concrete barriers in an effort to contain the tank. Four levels of play make this animated game fun for everyone. Written in BASIC with machine language subroutines. **$11.95**

CIRCLE 195 ON READER SERVICE CARD

VIC-20, continued...

Documentation

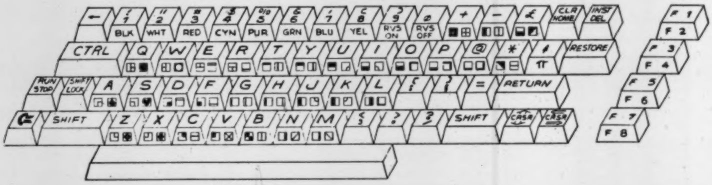
The "friendly computer guide" produced by Avalanche Inc. for the VIC-20 is excellent. We have tried it with young children (ages 10 and 11) as well as adults of both sexes and in all cases have found that people are able to get into programming the computer very quickly and easily using this guide. Unlike other manuals it gets into graphics, animation, sound and music before it actually gets into the Basic language, variables, input statements and the like. Unfortunately, as a result, it does not go very deeply into the Basic language and one would be hard pressed using the manual alone to write more than a very simple program.

We tried writing a graphics game using only the information in the "friendly guide" and succeeded quite well in a minimum amount of time (see accompanying "Catch The Bombs" program).

In summary

At $299.95, the VIC is a most impressive and capable computer. Features we liked the most were the large, full stroke keyboard, function keys, excellent graphics character set, built-in tone generators, and user-friendly manual. We are disappointed no mass storage device is yet available and we think for some applications 5K of memory will not be nearly enough. The early VICs were plagued with a variety of maladies mostly traceable to insufficient cooling. This problem seems to be cured, as we have used our VIC for long periods of time in relatively warm surroundings. However it is too soon to make any judgements with respect to reliability or manufacturer support. Early indications look positive. We recommend it. ☐

Figure 1. Each key has three functions on the VIC-20 keyboard.



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Catch The Bombs

Writing the Program

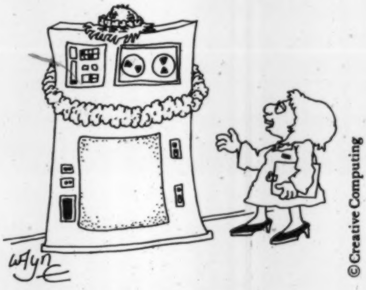
"Catch The Bombs" was written as an experiment to see what someone with little or no knowledge of graphics programming could do given a plain vanilla 5K VIC-20 and the guide "Personal Computing on the VIC-20." This 164-page book is termed "a friendly computer guide" but it should not be considered a replacement for a programmers's reference guide.

My idea was to write a simplified version of the *Mad Bomber* game marketed by *Activision* and *Creative Computing*. In this game, a mad bomber at the top of the screen drops bombs which the player must catch (Activision) or shoot (Creative Computing).

With any programming problem, the approach I take is to break the problem into small pieces. Hence, I started this one by trying to develop a routine to move a basket back and forth at the bottom of the screen to catch the bombs. While it was easy enough to form a basket using three characters of the extensive VIC graphic character set, it could not be moved quickly since all three characters had to be redrawn for each new position.

Hence, I settled for three identical characters which effectively form a paddle, not a basket. However, it moves quickly since the program only has to erase a character at one side and draw one at the opposite side to move one pixel (picture element).

The VIC does not have graphics commands in Basic like other computers. Instead, armed with a memory map of the screen one must poke a graphics character code into the desired screen location. For example, POKE 7910, 81 puts a ball in the center of the screen. POKE 7910, 32 puts a space in the same location, thereby erasing anything else.



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Catch Bombs, continued...

My first basket movement routine had 30 statements. Making it a paddle reduced it to 21 and two further improvements reduced it to 14 statements (100-330).

The second problem I attacked was making a ball (or bomb) drop. The user's guide has a short program to bounce a ball around the screen. It was a simple matter to eliminate horizontal (x) movement and make the ball drop. Unfortunately, it was not at all easy to add a second ball and have them drop simultaneously. No matter what I did, I always wound up with one ball dropping and then the other.

Finally I scrapped the copied routine entirely and started from scratch with a flowchart. This led to an entirely different generalized approach which would work for any number of balls (or bombs) dropped simultaneously. I settled on three bombs with the second released after the first had dropped five pixels and the third released after another 5-pixel interval (line 570). For a faster game, the bombs can be dropped at three- or four-pixel intervals.

The other routines (introduction, explosion, scoring) were relatively straightforward and are described in the marginal notes on the listing.

Playing the Game

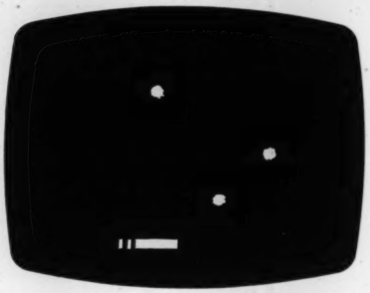
After the game is loaded or keyed in, the title block appears for a few seconds. During this time the player should press the SHIFT LOCK key.

To start the game, press any key. The paddle is moved back and forth using the right and left arrow keys ("upper case" comma and period). I recommend using the index and middle finger, one on each key.

The bombs fall in groups of two or three. The object is to move the paddle (basket) under each bomb and catch it. Each bomb that is caught will remove a segment of the paddle which can be restored by pressing either arrow key.

A bomb which is not caught causes an explosion. After ten rounds, the program will tell you how many bombs were caught, how many exploded and the percentage score.

If you find the game too easy, drop the bombs closer together by changing statement 570 to Y(X) = -4*A. Another nice addition would be sound effects when a bomb is caught or when it explodes. Have fun! □



SORRY BEEN DONE
SANDY

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"Now, now, Wayne. I'm sure you'll think of an original, fun game someday."

```
2     PRINT "♥"                               Clears the screen
5     PRINT:  PRINT "  CATCH THE BOMBS"
10    PRINT:  PRINT "   BY DAVID AHL"
15    PRINT:  PRINT "  COPYRIGHT 1981"
20    PRINT  "CREATIVE COMPUTING"
25    G = 10:  EX = 0 : DIM Y (23)            Initialize game and explosion counter
30    PRINT:  PRINT "PRESS SHIFT LOCK"
35    FORT = 1 TO 300: NEXT T
40    PRINT "♥": POKE 36879,27
45    PRINT:  PRINT "TO START PRESS ANY KEY"
50    GET A$: IF A$ = "" THEN 50
60    PRINT "♥" : POKE 36879,9              Clear screen, make black background
70    POKE 8174,120 : POKE 8175,120 : POKE 8176,120  Draw paddle at bottom
                                              center of screen
                                              (Paddle is 3 pixels wide)
80    P = 10 : G = G + 1                      Paddle position  = 10
90    GOTO 500
100   B$ = "" : GET B$                        Paddle movement subroutine
110   IF B$ = "<" THEN 200
120   IF B$ = ">" THEN 300
130   RETURN
200   P = P-1                                 Move paddle left
210   IF P < 0 THEN P = 0                     Check for left edge of screen
220   POKE 8167 + P, 32                       Erase rightmost segment
230   POKE 8164 + P,120                       Draw new left segment
240   RETURN
300   P = P + 1                               Move paddle right
310   IF P > 20 THEN P = 20                   Check for right edge of screen
320   POKE 8163 + P,32                        Erase leftmost segment
330   POKE 8166 + P,120                       Draw new right segment
340   RETURN
500   REM: MAIN PROGRAM
510   FOR N = 1 TO 22                   ┐
520   Y (N) = 0 : NEXT N                ┘     Set all columns to 0
530   C = 0                                   Counter = 0
540   FOR A = 1 TO 3                    ┐
550   Z(Z) = INT (22*RND(1))            │     Pick columns for bombs to drop
560   X = Z(A)                          │
570   Y(X) = -5*A                       │     Starting height for each bomb
580   NEXT A                            ┘
600   FOR A = 1 TO 3                    ┐
610   X = Z(A)                          │
620   POKE 7724 + X + 22*Y(X),32        │     Erase last position of bomb
630   POKE 7746 + X + 22*Y(X),81        │     Draw bomb one pixel lower
640   GOSUB 100                         │
650   B$ = ""                           │
660   Y(X) = Y(X) +1                    │     If bomb hits paddle on next move,
670   IF Y(X) < > 19 THEN 690           │     consider it caught, otherwise go to
680   IF PEEK (8164 + X) < > 120 THEN 75      to explosion subroutine
690   NEXT A                            ┘
700   C = C + 1                               Increment counter
710   IF C < 40 THEN 600                      Get all bombs down
720   IF G > 10 THEN 40                       Play 10 games
730   GOTO 850
750   PRINT "♥" : FOR N = 1 TO 3        ┐     Explosion subroutine
760   FOR I = 9 TO 111 STEP 17         ┐│     Step through bright colors
770   POKE 36879,I                     ││
780   FOR T = 1 TO 60:NEXT T           ││     Hold color on screen briefly
790   NEXT I : NEXT N                  ┘┘
800   EX = EX + 1                             Explosion counter
810   GOTO 720
850   PRINT "♥" : POKE 36879,27
860   PRINT : PRINT EX "BOMBS EXPLODED"       Game results
870   PRINT : PRINT 30-EX "BOMBS CAUGHT"
880   PRINT : PRINT "SCORE IS" INT(100*(30-EX)/30)"90"
890   FOR T = 1 TO 14 : PRINT : NEXT T
900   END
```

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The LNW-80

Better Than The Real Thing?

George Blank

Question: What would happen if you took a TRS-80 Model I, put it in a metal case; added a fan to avoid overheating problems; made the numeric keypad and RS-232 interface standard; added double density disk drives; included high resolution color graphics; doubled the speed to 4 megaHertz; added a 24 line by 80 column screen display format; added a few keys, including brackets, control, and shift lock; and put the arrows together for more convenient use?

Answer (choose one):

a) The TRS-80 Model I would be obsolete.

b) Many people would lose interest in the Model III.

c) You would have an LNW 80.

d) All of the above.

The answer, of course, is "d," all of the above.

When I first saw the advertisements for the LNW-80 computer, I was not impressed. I thought it must be just a cheap rip-off of the TRS-80. Because the ad was all text, with just a tiny unappealing picture of the keyboard unit, I never even bothered to read the specifications. However, we had been experiencing reliability problems with the TRS-80 Model I computers we were using in typesetting, and decided to try out the advertised substitutes to see if they had fewer problems with loss of memory. We ordered a PMC 80 and LNW 80 for review. Although we wanted both systems fully configured with disk drives, the expansion interface on the PMC 80 was not available, so we received only a tape version. Hence this intended comparative evaluation became a one product review of the LNW 80.

When the LNW computer arrived, I sent the boxes into our software department to be set up and tested. But when we unpacked the box, I changed my mind. The solidly built, compact and attractive keyboard unit, the BMC green phosphor monitor, and the RS 232 connector on the back won my heart in a flash, and I ordered my TRS-80 to leave the office so the handsome stranger could take its place.

We were in a rush to review the computer for our buyer's guide issue, so I received one of the first units shipped. In fact, mine came even before they silk screened the labels on the back of the case, but it was not difficult to figure out what connected where. I turned on the system. It came up with the clearest and sharpest display I had seen on any microcomputer.

The next surprise was the low hum of the fan, and the air flowing through the slots on the top. Since I considered memory chip overheating the source of almost the problems we have experienced on our Model I systems, I was delighted. I then hooked up the two Vista V80 drives that we ordered with it, and booted the system with the DOS Plus 3.3D diskette supplied. It booted without any trouble.

I then tried to boot one of my Model I NewDOS diskettes, and got only the message "DISK ERROR." I shifted to LDOS, which came up on the screen, and printed the greeting message, but never returned a "Ready". I called the company to find out what was wrong. I was told that only DOS PLUS could handle disk access at 4 megaHertz, and that I needed to change the position of a switch on the back of the unit for other systems. I flipped the switch, and both NewDOS and LDOS came up without problems. That did not mean I was stuck with using the computer at Radio Shack's low 1.8 megaHertz speed, however. The LNW 80 is smart enough to zip along in high gear (4 mHz) until it comes to disk I/O, and then shift down into low (1.8 mHZ) just long enough for loading, saving, and other disk operations.

With sheer delight, I loaded Scripsit. My glee increased when I pressed the right arrow and watched it zip through the text at more than double speed. I had hoped that I might be able to get the full 24 by 80 display on Scripsit, but that is under software control, and I received only the normal TRS-80 16 by 64 display. After reading the manual, I found that the 24 by 80 mode requires complex user programming and 16K of memory for screen display. Even program listings on the screen come out normally as 16 rows of 64 characters.

The LNW 80 claims 100% compatibility with TRS-80 Model I software. Because it is set up for double density operation, it is also possible to transfer Model III programs and files back and forth using DOS Plus. The way to do it is to use DOS Plus for the Model III to read the program to be converted from a TRS DOS disk and write it to a DOS Plus disk. Then you can read the program using the DOS Plus for the LNW 80, which is supplied with the computer if you buy it with a disk drive.

In addition to standard TRS-80 Graphics, the LNW 80 has three other graphics modes. Mode 1 is high resolution black and white, with a resolution of 460 by 192 pixels. This mode requires the lower 16K of RAM for graphics information. It is rather complicated to work with, but a demonstration program is included with machine language support routines that can be used in your own programs. I found it quite simple to substitute lines in the demonstration program to create my own graphics. To visualize the ability of the LNW 80 high resolution graphics, look closely at the dot over the "i" on a TRS-80 Model I or Model III. That is the size of one of the addressable pixels, and normal

Comparison of TRS-80 Compatible Systems 48K of Memory, 2 Disk Drives

	TRS-80 Model I	TRS-80 Model III	LNW-80	PMC 80
Price	$2,374	$2,614	$2,264	$1434 + Drives (1)
Model I software?	All	Most	All	All
Lower Case	Option	Yes	Yes	Option
Keyboard	65 Key	65 Key	74 Key	68 Key
RS 232 Port	Option	Yes	Yes	Yes
Numeric Key Pad	Yes	Yes	Yes	Yes
Hi Res Graphics	No (2)	No	Yes	No
Color Graphics	No (2)	No	Yes	No
Disk Density	Single (3)	Double	Both	Single
Cassette included?	Yes	No	No	Yes
Cassette Speed	500 Baud	500/1500 Baud	500/1000 Baud	500 Baud
Fan	No	No	Yes	No
Z-80 Speed	1.8 mHz	2.0 mHz	4.0 mHz	1.8 mHz
Address	(discontinued)	Radio Shack Ft. Worth, TX 76102	LNW Research 2620 Walnut Tustin, CA 92680	PMC Corp. 475 Ellis St. Mt. View, CA 94043

Notes: (1) PMC does not sell disk drives
(2) Programma International sells The Electric Crayon to add Hi Res Color Graphics
(3) LNW Doubler and Percom Doubler will both allow double density on Model I

characters are plotted on a matrix of those dots that is six dots wide and eight dots high. With 80 columns across and 24 rows down, you can plot 480 dots across and 192 dots down, or define your own characters and print them the way letters and numbers are printed.

There are also two color modes, if you have a color monitor. The LNW 80 requires a monitor, and cannot use a television set. Low resolution (128 by 192 pixels) color graphics with eight colors are standard. The colors are white, green, yellow, red, magenta, blue, blue green, and black. There is also a high resolution color graphics mode, with 384 by 192 dot resolution. This costs an additional $150 and requires an expensive (about $1000) RGB color monitor instead of the less expensive (about $400) NTSC monitors usually sold for computer use.

There are two speeds for cassette I/O. The 500-baud tape speed reads standard Model I and low speed Model III tapes. The other speed is 1000 baud, twice as fast, but not equal to the 1500 baud of the high speed Model II tapes. No cable or cassette recorder comes with the computer.

The computer sells for $1,914 with a black and white monitor and one double density disk drive. I recommend spending an additional $125 for the BMC green phosphor monitor. Additional Vista V80 disk drives are available for $350 each. The price for the computer without monitor or drives is $1450. Partial kits are also available, starting with just the circuit board and manual for $89.95. While a complete kit with all the parts is not available, you can purchase the circuit boards, manuals, keyboard, case, double density board, DOS PLUS, 48K of memory chips, transformers, expansion cable, floppy disk controller, UART, video parts, and a starter parts set for $857.80. Do not expect Heathkit type documentation; this is a difficult kit to build.

What do I think of the computer? Until using this computer, I wanted to replace my Model I at home with a Model III. Now I am tempted to use the LNW 80 instead. I have not used the system long enough to know about any maintenance problems. If it proves reliable in frequent use, we may convert our typesetting operations over to the LNW 80. ☐

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** PMC Product of Personal Microcomputer, Inc.

COMPARE THE FEATURES AND PERFORMANCE

FEATURES	LNW80	PMC-80**	TRS-80* MODEL III
PROCESSOR	4.0 MHZ	1.8 MHZ	2.0 MHZ
LEVEL II BASIC INTERP.	YES	YES	LEVEL III BASIC
TRS80 MODEL 1 LEVEL II COMPATIBLE	YES	YES	NO
48K BYTES RAM	YES	YES	YES
CASSETTE BAUD RATE	500/1000	500	500/1500
FLOPPY DISK CONTROLLER	SINGLE/ DOUBLE	SINGLE	SINGLE/ DOUBLE
SERIAL RS232 PORT	YES	YES	YES
PRINTER PORT	YES	YES	YES
REAL TIME CLOCK	YES	YES	YES
24 X 80 CHARACTERS	YES	NO	NO
VIDEO MONITOR	YES	YES	YES
UPPER AND LOWER CASE	YES	OPTIONAL	YES
REVERSE VIDEO	YES	NO	NO
KEYBOARD	63 KEY	53 KEY	53 KEY
NUMERIC KEY PAD	YES	NO	YES
B/W GRAPHICS, 128 X 48	YES	YES	YES
HI-RESOLUTION B/W GRAPHICS, 480 X 192	YES	NO	NO
HI-RESOLUTION COLOR GRAPHICS (NTSC), 128 X 192 IN 8 COLORS	YES	NO	NO
HI-RESOLUTION COLOR GRAPHICS (RGB), 384 X 192 IN 8 COLORS	OPTIONAL	NO	NO
WARRANTY	6 MONTHS	90 DAYS	90 DAYS
TOTAL SYSTEM PRICE	$1,914.00	$1,840.00	$2,187.00
LESS MONITOR AND DISK DRIVE	$1,450.00	$1,375.00	---

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  - RGB Output - 384 x 192 in 8 Colors
  - NTSC Video or RF MOD - 128 x 192 in 8 Colors
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- 4 MHz CPU
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- BARE PRINTED CIRCUIT BOARD AND MANUAL	$69.95
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- Precision write precompensation circuit
- Software switch between single and double density
- Easy plug in installation requiring no etch cuts, jumpers or soldering
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*** Doubler is a product of Percom Data Company, Inc.

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. LNW80 "Video parts set"	LNW80-2	$31.00
. LNW80 Transformer	LNW80-3	$18.00
. LNW80 Keyboard cable	LNW80-4	$16.00
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. Floppy Controller (FD1771) and UART (TR1602) . . .		$30.00

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Xerox Enters The Personal Computer Market

Stephen B. Gray

A low-cost desktop workstation that can be used as a personal computer, word-processing system or both, by clerical, professional, managerial and decision-making executive personnel, was introduced recently by Xerox Corp. The introduction makes Xerox the first major American office products company to enter the personal computer market. Other manufacturers, such as IBM and Digital Equipment, are expected to follow suit this year.

A Xerox executive described the 820 as "a low-cost, entry-level system for everybody in the office. It's easy to use, easy to learn. It's designed for electronic mail. It's most suited to the low-volume user who generates from one to ten pages a day."

$2,995 Without Printer

Purchase price of the basic Xerox 820 information processor is $2,995, including display screen, keyboard, and disk storage. As a word processing system with an optional 40-cps printer, purchase price is $5,895. Software is priced separately. The 820 will be sold through Xerox Stores, other retail outlets, OEMs, dealers and distributors, as well as by the company's national Office Products Division sales force. It will be marketed in Europe by Rank-Xerox.

The code name for the 820 during development was Worm, according to OPD president Donald J. Massaro, who said he'd wanted to have the product officially named Worm, "not because it will eat Apples, but because it's a Wonderful Office Revolution Machine."

"The 820 isn't a home computer," said Massaro. "It's a personal computer to go on the desk of a professional, for office use. It's not offered without the display. You can't hook it up to your TV set."

Continuing in the same vein, Massaro said, "If Exxon can put a tiger in your tank, why can't Xerox put a Worm on your desk?" What the marketplace needs, he continued, is an electric typewriter and low-cost word processor for clerical people, a desktop computer and intelligent terminal for the executive, and a small-business system, all in one price-sensitive product.

The 820 can operate as a standalone unit, and can also be connected to the Xerox Ethernet local area communications network that links different kinds of office equipment for high-speed exchange of information.

Although the 820 has no graphics capability, Massaro said "We're looking into that. As for color, we haven't made a decision; however, color is necessary in networking."

Software

Current software for the 820 includes word processing, Digital Research's CP/M operating system, Microsoft's Basic-80, Cobol-80 and Z-80 assembler, Compiler System's CBasic II, and applications packages from Structured Systems Group, MicroPro International, Microsoft, and others, including an electronic worksheet package called Supercalc.

Supercalc provides 60 variable columns, for five years of monthly data, with 250 items per column.

Other languages for the Xerox 820 are "available in industry," and include Fortran, Pascal, PL/1, and APL.

The CP/M operating system is $200 for the prepaid license fee; the word processing software is $500.

Hardware

The Xerox 820 consists of three basic, separate components: a display/processor, keyboard, and dual 5 1/4" floppy-disk drives.

A 12" screen displays white characters on a dark background and has a capacity of 24 lines of 80-characters each. The 820 uses the 2.5-MHz Z80 microprocessor, and has 64K RAM and 4K of ROM. The basic system includes dual RS-232 serial ports, one for the printer and one for communications. Dual parallel ports are also standard.

The system uses a 96-character ASCII keyboard with two operator keys: CONTROL and HELP. The Shugart SA-400 dual disk drives are single-sided, single density, and can store 92K characters of data, which is about 45 pages of text. Optional Shugart SA-800 8", single-sided, single-density dual drives can store 300K characters, or about 140 pages of text.

The optional printer is a letter-quality daisywheel Xerox Diablo 630 that prints bidirectionally at 40 characters per second. It can use either plastic or metal print wheels with 88, 92 or 96 characters in either 10 or 12 pitch. A non-Xerox printer can be used through the standard RS-232 interface.

Menu-Driven

The 820 is menu-driven. When the full menus are displayed, each uses the

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WHAT'S IN A NAME?

We've changed the name of our product line. Originally, we called our products *"Phoenix"* because we saw the phoenix as an appropriate symbol of quality. Unfortunately, a lot of *other* companies chose Phoenix as well, and there was some concern that the market place would become confused.

Our new name, *PALANTIR*™ (pronounced *pal'anteer*) is not a new name for us since it's our corporate name. It comes from J.R.R. Tolkien's *The Lord of the Rings* and describes a black crystal ball, a "seeing stone", used to see things at a distance.

Whatever the name on the package, the software in the package hasn't changed. It is still the highest quality business software you can buy for your microcomputer.

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All five *PALANTIR*™ general accounting packages (General Ledger, Accounts Receivable and Payable, Payroll and Inventory) were designed by CPA's based on similar packages from mini and mainframe computers. The programs are COBOL with an integral assembly language data base. They are integrated to allow automated posting to the General Ledger. An internal screen handler permits full-screen data entry for speed and ease of use. Although we made cosmetic enhancements prior to distribution, the basic programs have been user-tested for at least eighteen months.

PALANTIR™ Accounting also includes a growing number of specific application packages. We have completed or scheduled for completion Fixed Assets, Tenant Processing, Mail Management, Financial Projections and Time Billing. Each package stands alone, but many also work in conjunction with other *PALANTIR*™ packages. For example, Mail Management will work very well by itself, but we also designed it to fit in easily with the merging capabilities of Word Processing.

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Xerox, continued...

top 12 lines of the screen. The menus are automatically suppressed to allow more typed lines to appear on the screen. When the menus are no longer needed as reminders, the operator can suppress them so that all 22 lines are visible on the screen.

Features of the Xerox 820 include regular and decimal tabs, searching forward or backward, global find and replace, save original document, headers and trailers, document titles, wraparound display, copy/move, reformat, pagination, repeat keys, auto centering, auto underscore, super/subscripts, etc.

The 820 as first offered is TTY-compatible so as to be compatible with Ethernet. IBM 3270 compatibility will be provided in the fourth quarter of 1981.

Sales and Support

For support, Xerox offers a yearly maintenance contract, and will set up service centers. The customer can call a center and arrange for pickup and subsequent delivery of his 820 or can bring it in himself.

Diagnostic disks that can be run by the operator are available. A 20,000-word spelling checker is "available in the industry."

The Xerox OPD sales force will market the 820 primarily to the Fortune 1000 companies, who will be offered the 820, 860 word processor, 8010 Star, and Ethernet. Another market is the 4 to 6 million small businesses in the U.S.

Asked if the 820 is a "me-too product," Massaro said, "I'd like to see the Star, or a Star-derivative machine, on executive desks, but it's too expensive. There are 60,000 personal computers in the Fortune 1000 companies. We can provide a personal computer, and migrate up to a Star, 860, etc."

(The 8010 Star information system, introduced earlier this year, has a base price of $17,500, and can compose both text and graphics, with a bit-mapped display of 827,392 dots and the ability to display type fonts from 8 to 24 points.)

Wide-Open Market

Commenting on a question about Xerox getting back into the computer business, after the failure some years ago of Xerox Data Systems (bought as SDS), Massaro said, "This isn't an attempt to diversify, as was SDS, into mainframes, where you're up against one dominant company. This is a wide-open market. We're trying to test the price elasticity of the market, with an entry-level machine. A manager can put one on the desk of every secretary, without having to justify the price."

> ***"We're trying to test the price elasticity of the market, with an entry-level machine."***

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First Impressions

There seems to be a trend these days to view the new line of small computers as nothing but expensive toys or smart games. Whether or not such opinions are justified, there is no way that the HP-83 Personal Computer from Hewlett-Packard could fall prey to this description. Other computers from the HP Series 80 have graced the workbenches of scientists and engineers for years, performing heavy-duty number crunching with smooth reliability. The HP-83 seems to be extending the attraction beyond the realm of science into the business world, offering an expandable system with a variety of add-on devices and a promise of good software support. Let's start with the main unit.

The computer is an all-in-one unit of the form that is becoming popular these days. The console contains the computer circuitry, a full keyboard with numeric keypad, a small display screen, and slots for connecting peripheral devices. The entire unit is housed in a sturdy, attractive plastic case. Installation is simple. The user merely sets a switch for the correct voltage and inserts one fuse. The 83 is now ready to run. The 300-page manual begins by explaining the calculator mode. Problems are entered in standard fashion; no PRINT statement is required to produce the answer. The full range of arithmetic, algebraic and trigonometric operators is available, with radian or degree mode for trig calculations. Variables are allowed, making any series of calculations a simple task. There is also a RESULT key which prints the result of the most recent operation.

> ***While the math capabilities will delight the scientist, the 83 also has much to offer the businessman.***

So far, none of this is extraordinary; one can do the same things on a pocket calculator. But the manual goes on to explain editing techniques. It is here that the first taste of HP magic appears. Let's say the expression 5 + 7 is entered. On hitting the ENDLINE key, the answer 12 will appear. Now, using the up arrow, the cursor can be moved over the 5. If it is changed to a 6 and ENDLINE is pressed again, the computer will produce the correct answer for the new equation. In other words, changes can be entered without recopying the entire line. With another keystroke, one can enter the insert mode, allowing longer portions to be placed into existing expressions.

Getting Down to Basics

The experienced programmer will be able to use the 83 almost immediately. It uses a fairly standard form of Basic. Beginners will find the manual clear and helpful, with many sample programs and comprehensive explanations of all functions, statements, and operations.

The full-size keyboard and crisp video display make programming a pleasure on the 83. The small 5 1/2" screen is limited to 16 lines of 32 characters, but the letters are remarkably clear. Information that has scrolled past the top of the screen can be retrieved with the ROLL key. The three most recent screen displays are stored in memory and can be rolled into view at any time. While lines are limited to 32 characters, an expression can be up to 95 characters in length, and multiple statements are allowed.

The keyboard abounds with special keys, including LIST, PAUSE, CONT, a STEP

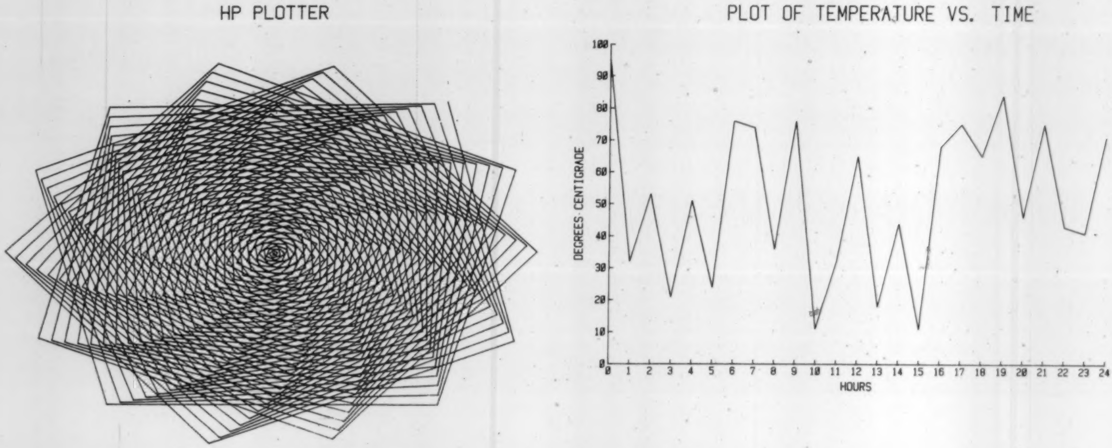

Figure 1. Products of the plotter.

control which is handy for debugging, and AUTO which provides automatic line numbering for Basic programs. Other wonders include a built-in command for renumbering parts or all of a program; special math constants such as pi, epsilon, and infinity; nesting of up to 255 loops; and user-definable multi-line functions. There are also eight special keys which can be used to control program flow. The keys can be labeled and the labels can be displayed at the bottom of the screen. The keys are used with statements such as ON KEY# 1 GOTO 500 or ON KEY# 5 GOSUB 2000.

The 83 has three timers which can be used for program interruption or branching. Internal time is set in a rather bizarre fashion. The user specifies the number of seconds since midnight. The time can be recalled and displayed, but the user who desires any standard information such as hours or minutes must include the necessary calculations in his program.

While the math capabilities will delight the scientist, the 83 also has much to offer the businessman. The Basic includes all the essential functions, including POS, LEN, VAL$, and LEN, as well as a PRINT USING which, combined with the IMAGE command, allow for powerful formatting capabilities. Moving beyond text and numbers, we get to the area where the HP-83 really shines.

Picture Perfect

The graphics display of the 83 has a resolution of 256 horizontal by 192 vertical pixels. Combine this resolution with an expansive set of graphics commands and the result is a system with astounding capabilities. Again, the manual does an admirable job of explaining everything. To start, one can scale the screen, with independent control of the range for each coordinate. For example, the statement SCALE -10, 10, 0, 1000 defines a coordinate area from -10 to 10 on the X axis and from 0 to 1000 on the Y axis. There are commands for drawing the actual axes, and for placing tic marks on each axis. XAXIS 0, .5 will place the X axis at Y value 0 and put a tic mark each .5 unit along the line. The spacing for the tic marks is relative to the defined scale.

In a manner similar to turtle graphics, the user can control whether the pen is up or down, and move the pen to any location on the screen. Graphics, charts, and shapes are very easy to produce in this manner. Beyond mere graphics, the user can label any section with either horizontal or vertical lettering. For more complex applications, figures can be defined and placed on the screen. These figures are defined as strings where the value of each byte in the string represents a set of eight pixels. To design a figure, the user must first plot a grid containing a binary representation where each 1 represents a pixel to be plotted and each 0 represents no change. The binary sequence is converted to decimal and concatenated into a string. This string is used in a BPLOT statement which places the figure on the screen.

Expansion

The HP-83 has four interface slots in the rear. These accept accessories such as ROMs, extra RAM, and peripheral connectors. The unit comes with 16K of RAM. An additional 16K can be added by sliding the appropriate cartridge into any of the four slots. The nice part of these slots is that no special addressing is required from the user. The computer is smart enough to know what is plugged in and doesn't have to be told which slot contains the extra RAM. Another special cartridge is available which can hold up to six ROMs. The ROMs are required for special applications and for use with certain peripherals. Here the picture begins to get a bit complicated. While the system is designed for modularity, and while peripherals are available, the user can become slightly bogged down in a flood of manuals, ROMs, and cables.

For example, the following indicates what a user might go through when hooking up a disk drive. The drive is a double-density double sided unit for mini-floppy diskettes. It comes with its own power supply, and a switch for proper line voltage. To use it, the Mass Storage ROM must be installed. This ROM comes with a booklet explaining installation of the chip and operation of the disk. Once the ROM is installed, one must connect the drive to the computer. This requires the HP Interface Module, which plugs into the back of the computer. The module comes with a cable that attaches to the back of the drive. The rear of the cable plug contains

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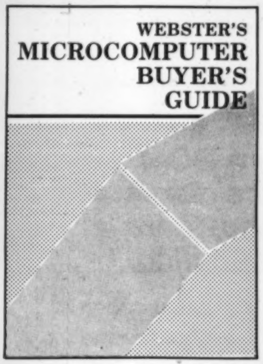
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HP-83, continued...

another opening so a series of devices can be chained to one interface. There are two manuals accompanying the Interface Module. Another manual comes with the drive, but this just covers initial set-up and disk care. The programming information is all in the manual that comes with the Mass Storage ROM. Once everything is attached and all the essential information has been ferretted out, the drive works fine. Disks must be initialized, which takes about two minutes. Each disk can hold an impressive 286K of data. Besides storing programs, the disk has a special command for saving the graphics screen. Thus an often-used format, such as a coordinate grid, can be saved and retrieved for later applications. Both random and serial access of data files are allowed, as well as array storage.

Though the installation procedure seems slightly complicated, there is actually an advantage to this sort of configuration.

By having a ROM handle the disk communication, there is no wait for booting.

By having a ROM handle the disk communication, there is no wait for booting. The disk is always available for access. Neither is there a chance of losing the operating system through disk failure. All of the crucial software is safely locked in the ROM. It should be mentioned that the drive is not exactly silent. There is a constant low-pitched whirr somewhat reminiscent of a car idling or a muted helicopter. While it takes a while to get used to this, the noise isn't really distracting.

Plot Lines

Another peripheral, and truly a nice piece of work, is the graphics plotter. As with the disk drive, interfacing the plotter requires a bit of patience and reading; a Printer-Plotter ROM and Interface Module are required. Again, instructions are somewhat scattered through several manuals. In contrast to the HP-83 manual, the plotter instructions aren't too clear. While examples are given, not enough specific instructions are included to allow for easy programming. Still, with a bit of experimentation, one can get wonderful results from the device.

The manuals contain sample programs with extensive remarks, but certain things are lacking. Parameters for some commands, as well as necessary syntax, are not covered in any depth. Throughout the manuals, there are hints of the many features of the plotter. It contains several character sets, allows user-defined characters and different size characters, and can place special symbols at vector points on graphs. The unit itself is compact and attractive. The front contains a series of buttons including PEN UP, PEN DOWN, arrows to move the pen, and CHART LOAD for moving the arm out of the way and installing a sheet of paper. There is also a CONFIDENCE TEST button which performs a test of the mechanical and electronic functions of the plotter. A sample output, taken from the cartoid program in the HP-83 Programming Guide, is shown in Figure 1. The lettering at the top is from one of the internal character sets.

Since it is likely that many of those who purchase plotters won't have the time to develop software, there is probably a good chance that specialized software will appear, allowing the HP-83 owner to make full use of this peripheral without the bother of programming. One such program is already available.

Software

One of the most popular and useful programs for small computers, *Visicalc*, comes on disk for the 83. This software is a natural companion for the HP-83, especially when combined with the additional plotting programs that resulted in the package being called *Visicalc Plus*. Visicalc files can be displayed as line charts, fitted curves, pie charts or bar charts, giving businessmen and scientists a powerful tool for graphic output. The program was slightly unfriendly to the user at one point. If it doesn't find a suitable data file for plotting, it offers a choice of either viewing the disk catalog or loading a data file. This can turn into an infinite loop if the right data file isn't available. Luckily, reset solves such problems. The manual for Visicalc is extensive and full of good examples.

The Bottom Line

The HP-83 is a sophisticated tool, with many capabilities. It is well designed and supported by a company with a good reputation. Anyone who requires complex number crunching or detailed business calculations should consider this computer as a serious alternative to expensive mini computers. The computer with 16K of RAM costs $2250, dual disk drives start at $2500, the plotter is $2450, the Interface Module is $395, and the ROMs for mass storage and for the plotter are $145 each. Finally, Visicalc Plus costs $200.

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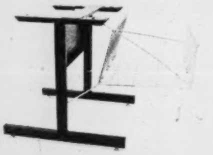

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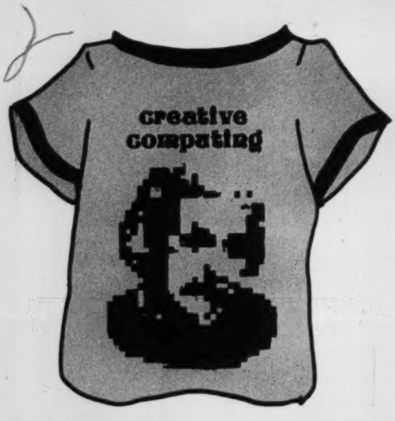
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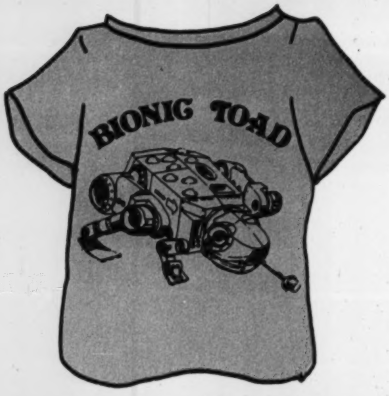
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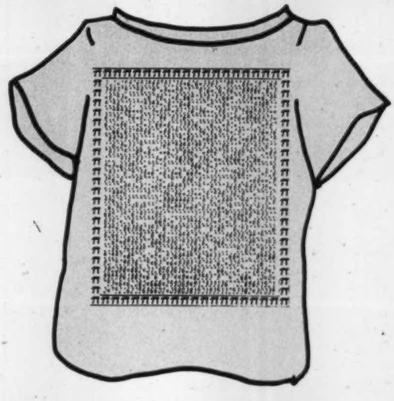
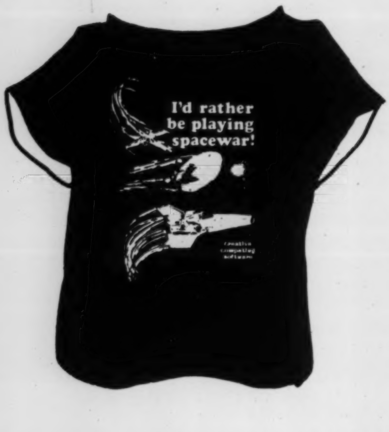
Creative's own outrageous **Bionic Toad** in dark blue on a light blue shirt for kids and adults.



Plotter display of **Pi to 625 Places** in dark brown on a tan shirt.

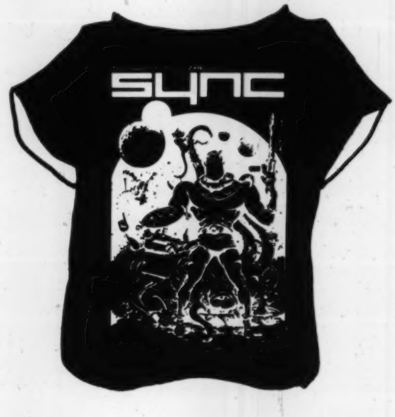

I'd rather be playing spacewar!
Creative computing software

I'd rather be playing spacewar-- black with white spaceships and lettering.

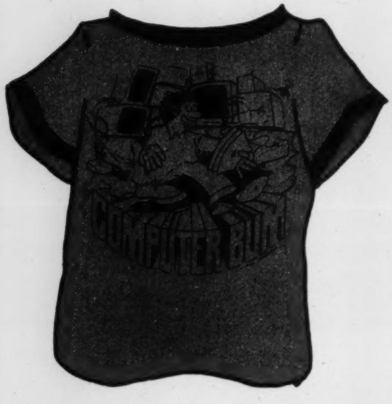
Give your tie a rest!

All T-shirts are available in adult sizes S,M,L,XL. Bionic Toad, Program Bug and Spacewar also available in children's sizes S(6-8), M(10-12) and L(14-16). Made in USA. $6.00 each plus 75¢ shipping.

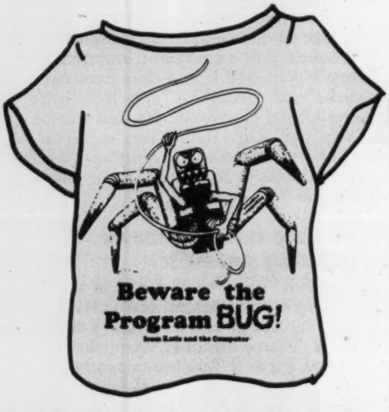
Specify design and size and send payment to Creative Computing, 39 E. Hanover Ave., Morris Plains, NJ 07950. Orders for two or more shirts may be charged to Visa, MasterCard or American Express. Save time and call toll-free **800-631-8112** (in NJ 201-540-0445).



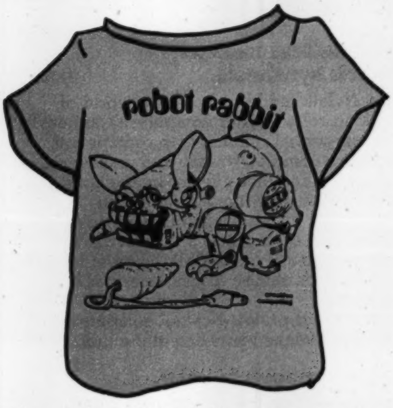
Crash Cursor and Sync from the comic strip in SYNC magazine emblazoned in white on this black shirt.


COMPUTER BUM

Computer Bum-- black design by cartoonist Monte Wolverton on gray denim-look shirt with black neckband and cuffs.


Beware the Program BUG!
from Katie and the Computer

The **Program Bug** that terrorized Cybernia in Katie and the Computer is back on this beige t-shirt with purple design. You can share the little monster with your favorite kid.


robot rabbit

Roll down the block with this little black **Robot Rabbit** (on a bright orange t-shirt) on your back and you can intimidate every carrot, radish or cuke in your way.

CIRCLE 350 ON READER SERVICE CARD

creative
computing
equipment
evaluation

The NEC PC-8001

David Lubar

More for Your Money

The new generation of computers seems to be splitting into two trends. One philosophy is to give consumers a lower-priced alternative. Examples of this include the Sinclair ZX80, the VIC-20, and the TRS-80 Color Computer. These products offer an opportunity to explore the world of computing with a small initial investment. The other philosophy is to produce computers in the same price range as the older models while offering more features. The NEC America PC-8000 series falls into this category. With high-resolution color graphics, mixed text and graphics on the same screen, a character set including graphics symbols, an eighty-column color display with upper and lower case, Microsoft Basic, a set of user-definable keys, full keyboard with numeric keypad, and a Centronics-compatible parallel interface, the NEC is advertised as "the end of the compromise." Whether this is true remains to be seen, but the computer seems promising, and it could have a good future in this crowded field.

This review will concentrate on the computer and video monitor. The disk drive and other peripherals will be covered at a later date. The unit is supplied with 24K of ROM (expandable to 32K), including Basic, and 32K of RAM. With system overhead, the amount of user RAM actually comes to a bit over 26K. But, when you consider that only 3K is required for screen display, there is plenty of memory left for programs. The rear of the unit contains interfaces for cassette, color monitor, monochrome monitor, and parallel and serial connections.

One of the first things to notice about the NEC is the well-designed editing function.

When you turn the computer on, it displays a greeting message letting you know that everything is ready to go. At the bottom of the screen, five boxes display the current contents of the definable keys. More on that later.

Ease and Power

One of the first things to notice about the NEC is the well-designed editing functions. One can move the cursor to any part of the screen, make a change in a statement, and register the change by hitting return. An insert/delete key allows one to remove unwanted characters or make space for additional characters. The only problem is that with both these functions on one key, it's easy to delete a character by mistake. If a key is depressed for more than one second, it will automatically begin repeating. This comes in handy for moving the cursor across the screen. The keyboard, though labeled only with alphanumerics, also offers a graphics character set and a Greek character set. The graphics characters, which include boxes of various sizes, card suits, and arcs, can be accessed either by using the graphics key, or through the proper CHR$ value from Basic. The Greek set is also obtained either through a special key or through Basic control. This set does not correspond to the English letter keys, but appears in order across the keyboard, with alpha on the Q key, beta on the W, gamma on the E, and so on. The full lower-case set is available; a limited upper-case set is obtained from part of the bottom row of keys.

The Basic is by Microsoft, and contains a few extra commands not found in many existing computers. Beside the usual string functions, there is INSTR, which returns the postion of a substring within another string. IF...THEN...ELSE statements are allowed. There is a SWAP command which exchanges the values of two variables. This could be very useful when doing sorting. LINE INPUT allows up to 255 characters, including commas, to be entered into a string. TIME$ can be used to return the value of the internal clock, and DATE$ gives the currently entered date. AUTO line numbering is available and there is a fast renumber command. There are four types of variables; string, integer, single precision, double prescision (with 17 significant digits), as well as multi-dimensional numeric and string arrays. In essence, the NEC has a powerful and useful version of Basic which the experienced programmer can use immediately and the beginner can learn quickly.

There are five definable keys which, combined with the shift key, allow for ten functions. The functions are defined as strings and definitions can be concatenated, allowing one to tack a return onto the end of a key command. Two-finger typists will especially appreciate this feature, since one can obtain a LIST or RUN a program with a single keystroke.

One overall impression of the system is that it is designed for flexibility. Many of the configuration commands for the display have three or four parameters, making initial use slightly tricky, but offering powerful potential. For instance, the user has control of the number of rows and columns shown on the screen. The command WIDTH 80,25 specifies 80 columns of text in 25 lines. The allowable column values are 80, 72, 40 and 36. There can be either 20 or 25 lines. When you change the format, the character size changes, thus a forty-column line makes as much use of the monitor as an eighty-column line. The CONSOLE command allows the user to set the top and length of the scroll window, switch the display of function keys on or off, and switch from color to black and white.

Graphic Delight

This brings us to the highlight of the NEC. The graphics, with eight colors and maximum resolution of 160 by 100, has the potential to produce excellent displays. Graphics and text can be mixed on the screen, allowing such diverse things as labeled graphs, captioned pictures, and score displays for games. Changing the width of the screen changes the resolution, allowing for low-resolution graphics. Individual plotting points can be turned on with the PSET command and turned off with PRESET. This works well for doing graphs. Another command draws a filled or unfilled box with either graphics points or text characters. More complex graphics, such as drawing shapes, can be accomplished using the GET and PUT commands. GET captures a rectangular portion of the screen display in an array. PUT places the display on the screen. While this allows for animation, the slow speed with which PUT works in Basic leads me to believe that most animation programs for the NEC will be in machine language.

Speaking of machine language, the computer can be programmed in Z-80 code. While there is no built-in assembler, one can enter code with POKE commands, or enter bytes directly into the monitor. The machine-language monitor is accessed with the MON command. This gives the user eight options: set or display values in memory; load, verify or save a tape; execute a machine-language routine; perform a memory test; or return to Basic. It's nice to see that NEC isn't trying to lock any secrets away from the user.

All this and More

The NEC can also function in a terminal mode, allowing it to communicate with other devices over an RS-232C interface. In this mode, the function keys control such features as full or half duplex. This capability is built into the machine and requires no additional software.

> ***Many of the configuration commands for the display have three or four parameters, making initial use slightly tricky, but offering powerful potential.***

A cassette interface is included with the computer. Programs are saved with a filename, and must be loaded using that name. One can determine the names of files on a tape by requesting the computer to load a dummy file. It will display the name of each file found as it searches the tape for the requested program. The tape interface worked perfectly. For additional peace of mind, a verify command is included which checks the contents of a tape against the contents in memory. The only problem with the system is that a LOAD command always clears memory, even if the requested file isn't found. Still, any cassette operating system that doesn't produce tons of error messages deserves praise.

On the negative side, there was one slight problem that occurred during testing. At times, a flicker would appear on the screen. This seemed to happen in two situations. If a listing was scrolling in the color mode, flashes of white dots would occasionally overlay a line or two. This also happened at one or two points while running some simple animation programs. The flicker resembled snow, but was limited to a small portion of the screen. The problem has nothing to do with the monitor, but seems to be related to the way the computer handles graphics. While it is slightly distracting, one gets used to it after a while.

Only 3K is used for screen memory; 2K for character codes and 1K for attributes such as color. The combination of low RAM usage with the ability to mix text and graphics introduces one limitation. After making twenty changes on any screen line, you lose control of color. From the twenty-first change onward, all points plotted on that line will be in the same color until some of the previous points are erased. But, except for people who like watching random-dot programs, this shouldn't be much of a limitation.

The color graphics of the NEC are seen at their best on a good video monitor. The PC-8043 from NEC is a 12" color monitor with beautiful resolution. Text and graphics appear crisp and well-defined on the screen. Unfortunately, the monitor costs almost as much as the computer. Fortunately, the computer comes supplied with a standard cable and can be used with any color monitor.

No one wants to buy a computer and then be unable to figure out how to use it. Fortunately, NEC seems to have spent a good deal of time making sure the documentation was clear and thorough. The *Basic Language Learning Guide* is almost a textbook on programming, including explanations of all aspects of Basic and questions at the end of each chapter. The *Microcomputer Reference Manual* gives an overview of the hardware, explains initial set up of the computer and peripheral, and gives capsule explanations and examples of all Basic commands and statements.

NEC seems to realize that a computer can't make it on the market without good software support. They have an open policy which encourages software houses to develop programs for the computer. On the business side, there is a lot in the works, including word processing, engineering packages, and utilities for stock forecasting. For entertainment enthusiasts, there should be a flood of good games in the near future. The NEC is the number one selling computer in Japan, the country which gave us Space Invaders, Packman, Galaxian, and other goodies. One of the companies developing software for the NEC is Broderbund, whose arcade games for the Apple have been quite good. All in all, there should be no problem with software support.

As mentioned, the NEC computer is competitively priced. The main unit costs $1295. A green display monitor is $285 while the color model costs $1195. Expansion is a bit expensive but still competitive. A dual disk drive costs $1295. While it may not be the end of the compromise, the NEC American PC-8000 series could be the start of something big. NEC America, Inc. is located at 1401 Estes Ave., Elk Grove Village, IL 60007. ☐

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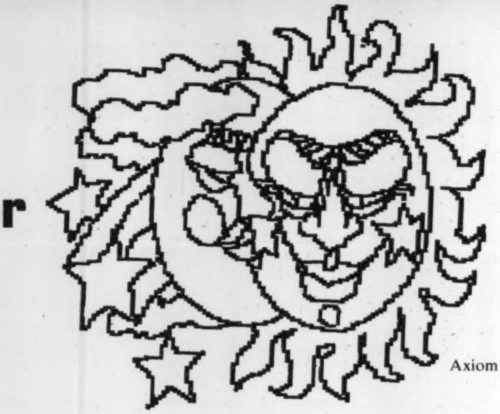
CIRCLE 134 ON READER SERVICE CARD

So You Want to Buy a Printer

George Blank


Axiom EX850 Screen Print.

If I could borrow a time machine for a few hours, I would like to go back into the dark ages and find a monk who had spent his entire lifetime copying a few books. After a demonstration beginning with a small personal computer word processing system using an inexpensive printer, I would like to show him some of the wonders of modern printers. There are printers which print graphics in full color, band printers that can print 1000 lines a minute across the full width of a five foot sheet of paper, and modern ink jet printers that can be used with computerized work stations to produce camera ready copy for a printing press.

Of course, few people are going to have $200,000 to spend on a Xerox laser printer for their $200 Sinclair ZX-80 computer, but the extreme cases mentioned above illustrate the problem of selecting the right printer. There are hundreds of different models from which to choose, starting at less than $100.

The most difficult part of selecting a printer is determining the features you need. There is no single "right" printer for everyone. Many features on some printers exclude other possible features. For example, it may be desirable to make one printer light and transportable, while another may have to be built solidly to stand up to industrial use. Yet each printer might be ideal for a certain personal computing application.

Probably the best way to start looking for a printer is to draw up two lists. The first list is of things you must be able to do with your printer. The second one lists the things you would like to be able to do. Here is a sample pair of lists:

Must List
Line listings for programs
Magazine articles
Routine letters
Interface to a TRS-80 Model I

Want List
Type envelopes for letters
Formal letters
Graphics for magazine articles

Separating out the things you must have from the things you desire but can do without gives you much more flexibility. For example, the average person could satisfy the requirements of the must list above with a printer like the Epson MX-80 for $545, and gain TRS-80 graphics as well for the magazine articles. Insisting on the requirements in the want list could easily triple the cost, and make the search much more difficult.

Printer Features

Once you know what you want to use a printer for, the next step is to match your requirements against the features of commonly available printers. The most basic differences between printers include print quality, paper feed, paper size, interfaces, noise, print speed, printer size and weight, special printing abilities, and price.

Print Quality

Probably the most important consideration after price for the average person is the quality of the printed output. This is primarily a function of the method used to form characters on the paper. The methods used, roughly in order of cost, are as follows:

1) Thermal printing, in which heat is used to bring out an image on the paper.
2) Electro-static printing, which uses a spark to do the same thing.
3) Dot matrix impact printers which use magnets to fire pins against a ribbon to transfer ink onto the paper.
4) Thimble, ball, or daisy wheel impact printers which work like a typewriter, pressing a fully formed letter against a ribbon to create a character.
5) Ink jet printing, in which a precisely controlled, electrically charged stream of ink is sprayed on paper to create characters of a quality similar to commercial printing.

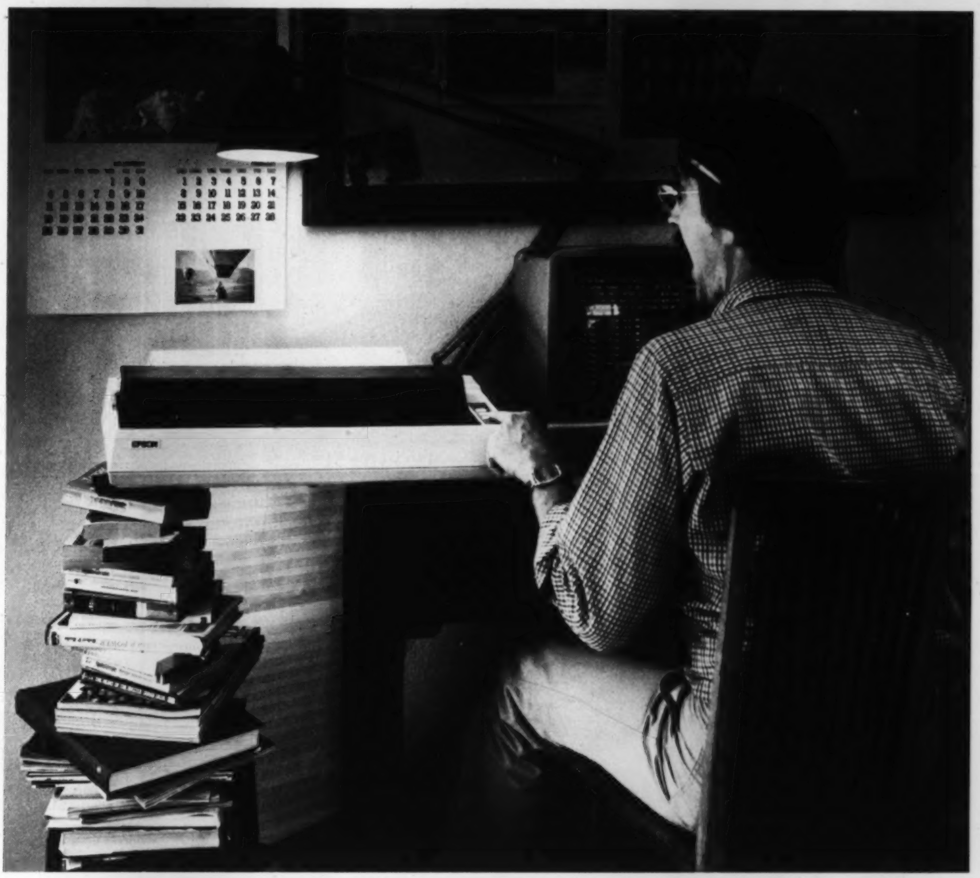
In general, each category of printer creates better looking printing than the preceding category, and costs correspondingly more. There are currently no ink jet printers at prices that make them practical for use with personal computers. Eventually ink jet printer prices might come down as low as $10,000, which would pose a severe threat to phototypesetting, and open up many new options to personal computer owners.

Fully formed character printers, including typeball printers such as converted IBM Selectric and Olivetti typewriters, thimble printers such as the NEC Spinwriter, and daisy wheel printers like the Diablo, Qume, and C. Itoh Starwriter, range in price from a little under $2000 to over $4000. They are referred to as letter quality printers because their print quality is suitable for formal correspondence.

The printers in the first three categories use the dot matrix method to form characters. That is, they construct a character out of a series of dots in a pattern shaped like the letter to be printed. If the pattern is five dots wide and seven dots high, the letter A might be formed like this:

```
. . ● . .
. ● . ● .
● . . . ●
● . . . ●
● ● ● ● ●
● . . . ●
● . . . ●
```

There is a large variety of dot matrix printers, and they have a wide range of print quality. As a purchaser, you will want to know the size of the dot matrix, which is related to the number of pins in the print head. With only a few pins, the print head will be less expensive and less prone to failure, since the failure of a single pin can make characters incomplete and tear up your ribbons and paper. On the other hand, with more pins and therefore more locations for dots, you can have more attractive characters. Most printheads have from five to nine pins. Five pins are adequate for roughly formed capital letters, seven pins allow lower case, and nine pins allow lower case with descenders. There are also tricks that allow descenders with only seven pins. If you want to evaluate the dot pattern of a dot matrix printer, pay particular attention to the lower case letter "j" since it should extend both above and below simpler letters



The MX-100. Not just better. Bigger.

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Our MX-80 was a pretty tough act to follow. I mean, how do you top the best-selling printer in the world?

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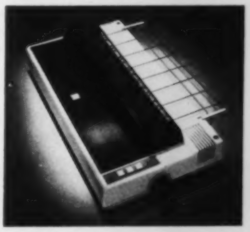
The MX-100 is a printer that must be seen to be believed. For starters, we built in unmatched correspondence quality printing, and an ultra-high resolution bit image graphics capability. Then we added the ability to print up to 233 columns of information on 15" wide paper to give you the most incredible spread sheets you're ever likely to see. Finally, we topped it all off with *both* a satin-smooth friction feed platen *and* fully adjustable, removable tractors. And the list of standard features goes on and on and on.

Needless to say, the specs on this machine — and especially at under $1000 — are practically unbelievable. But there's something about the MX-100 that goes far beyond just the specs; something about the way it all comes together, the attention to detail, the fit, the feel. Mere words fail us. But when you see an MX-100, you'll know what we mean.

All in all, the MX-100 is the most remarkable printer we've ever built. Which creates rather a large problem for those of us at Epson.

How are we going to top this?



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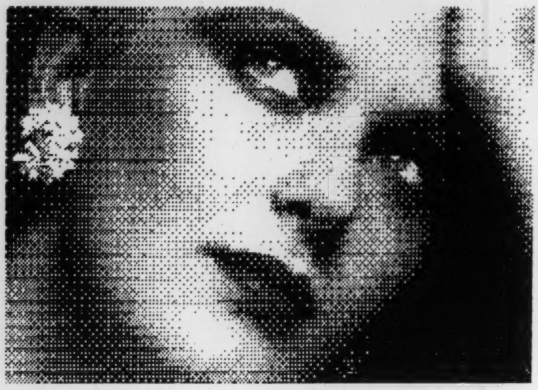
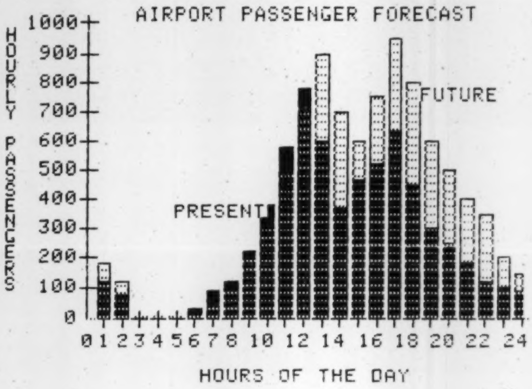
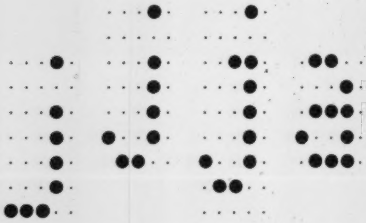
CIRCLE 256 ON READER SERVICE CARD





like the lower case a. Here are some of the patterns used for "j", along with a typical "a" for reference:

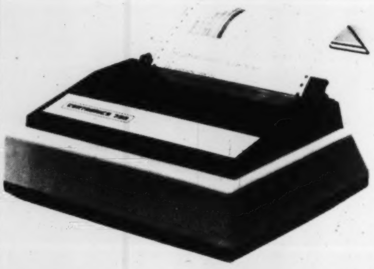


The width of the dot pattern is also significant. Many printers have a fixed character width, with typewriter style spacing. These printers leave just as much space on the paper for an "i" as they do for a "w." Other printers have variable width characters, so that a "w" might be two and a half times as wide as an "i." Whether or not a printer offers proportional spacing, it may have a condensed or high density dot format, which allows adjacent dots to overlap for more attractively formed characters.

If you are going to use a printer for letters or articles to be read by other people, you will probably want true decenders, preferably in a format that dots the j above the level of the lower case "a," with high density dots. Proportional spacing is significantly more attractive than typewriter spacing.

Other differences between the three types of dot matrix printers concern the type of paper. Thermal and electrostatic printers use special paper, which often costs considerably more than plain paper and is harder to find. Electrostatic paper is covered with a thin covering of aluminum which burns off to display dark paper underneath. The aluminized paper is very hard to read, but looks nice when photocopied.

The Centronics 739.



Paper Feed

How paper is pulled through the printer can make a major difference in the cost of a printer. The common options are friction feed, pin feed, and tractor feed. Friction feed simply pulls paper through like a typewriter. This is ideal for using stationary, envelopes, and ordinary sheets of paper. If you do examine a friction feed printer, check to see that the paper, even small pieces such as postcards is held firmly. Find out how many sheets of paper can fit in at once if you wish to use multipart forms. A rubber platen (the "roller") is better than steel, which is better than plastic. Some printers that have friction feed combined with tractor or pin feed, such as the NEC Spinwriter and Okidata M-82 have switches that turn off the printer when the paper is out. This can be a nuisance when working with small pieces like envelopes. Find out from the dealer how to override the switches.

Tractor or pin feed printers require special paper with holes along the side margins. Pin feed usually has plastic pins around the ends of the paper roller to hold the paper, while a tractor is a paper feed mechanism which holds the paper both before and after it goes around the roller. Tractors are often removable, and almost always allow you to adjust for different widths of paper, while pin feed is usually built in and is seldom adjustable. Usually a tractor gives you the best registration, followed by pin feed, with friction feed giving poor registration. Registration is a technical term for positioning a sheet of paper precisely so that a dot can go in exactly the right place. Registration is very critical in a graphics printer, especially for color graphics where the printhead may have to travel over the paper several times to print the different colors. Precise registration is also important when you are using superscripts and subscripts on a letter quality printer.

Printing Width

Another important consideration for a printer is the carriage width, which determines paper size. I am aware of printers with carriage widths ranging from two inches to over five feet. Related to carriage size is the number of columns of type that the printer can print across the page. There are some general rules that might be helpful in choosing the right carriage width.

A printer that is used for Basic line listings should print clearly at least as many columns across the page as appear on the screen to simplify debugging. Therefore an Atari needs at least 38 columns across, an Apple II 40 columns, a TRS-80 Model III 64 columns, and a Heath H-89 80 columns.

A printer used for letters needs to accept 8 1/2" paper with 72 to 80 columns across. A printer used for business or financial reports needs to print 132 columns across, as much financial software is set up this way.

Interfacing Your Printer

Of critical importance to you is that the printer you select be able to connect to your computer. In most cases, this is simple. The majority of printers come

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AUTOMATICALLY, IT WILL:

Center copy.
Line up decimal points.
Print vertical lines (to separate columns).
Layout columns.
Center titles (over a column).
Print flush right.
Return carriage (at end of line).
Paper feed to pre-set starting point.
Indicate end of page.
Set tabs from one to many.
Clear tabs from one to all.
Set temporary margins (wherever you like) as often as needed.
Repeat all typing keys as needed.
Underline copy.
Print bold face and underline.
Do reverse print (white on black), sort of "reverse Video".
Allow alphabetic and decimal tabulation.
Indent paragraphs.
Store in non-volatile resident memory:
  Often used line formats (margins & tab stops).
  Often used phrases (up to 835 characters) in 10 "bins".
  Up to 10 complete forms (tax, medical, insurance, etc.).
  Up to 14,000 characters in an additional 26 "bins*".
Print perfectly spaced proportional letters.
Return to typing position after correction with relocation key.
Allow one character to overlap another (Ø).
Right margin justification.
Print two columns with both right and left margins justified and the center ragged.
Lift off errors (from single character to entire line).

*Optional at extra cost.

CIRCLE 190 ON READER SERVICE CARD

IT WILL EVEN:

Allow a carriage return without a linefeed or a linefeed without a carriage return.
Allow you to pre-set an impression control for high-quality carbon copies.
Allow both vertical and horizontal half-spacing.
Allow cancellation of copy before printing.
Allow express and normal backspacing.
Print in four different sizes: 10 pitch pica, 12 pitch elite, 15 pitch micron.
Allow insertion of a missing character in an already printed line.
Accept paper up to 17" wide.

Backspace 1/10, 1/12, 1/15 or even 1/60 of an inch.
Buffer and print out one word at a time, or one line or as many as 10 pages*.
Print up to 198 columns.
Do 1/2 line spacing for footnotes and scientific notation.
Accepts carbon film or reusable nylon ribbons.

IT HAS:

A lighted key to inform you that it's set to temporary margin.
A factory installed noise reduction shield.
A 16K buffer/automatic spooler*.
A lighted key to indicate upper case only.
A Centronics standard parallel interface and can be ordered with:

RS-232 Serial interface* or
IEEE (PET) interface*.

A print speed of 20 cps and (because of logic seeking circuitry) a through-put of approx. 32 cps.
A built-in anti-glare shield.

IT EVEN HAS:

Carbon film ribbons in various colors.
20 character plasma readout that informs you as to:
  Number of characters to end of line.
  Number of lines left to end of page.
  The existence of an error condition.
  The contents of a memory "bin".
  Number of characters left in buffer.
An automatic "feature in use" indicator (centering, storage, etc.)
With scrolling, both FORWARD and BACKWARDS.

INCREDIBLE?

THE 221 OFFERS EVEN MORE!

It's totally compatible with all computers and software.
It will print in English, French, Spanish, Italian and German. It will automatically switch between English and foreign keyboards*. (Under computer control).
Scientific, mathematic, financial and legal daisy wheels available*.
Tractor feed available*.
Can be used as a stand-alone terminal*.
Can be used to access both TWX and TELEX networks*.

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TRY THE INCREDIBLE MACHINE.
TRY THE TYPRINTER 221.

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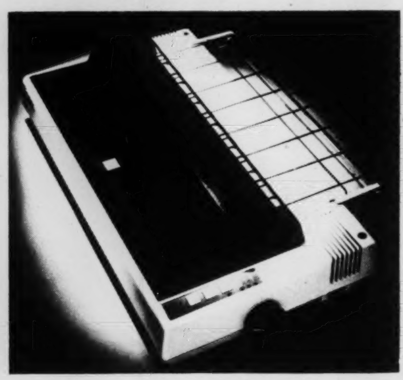


The Epson MX-100.

with either parallel or RS 232C serial interfaces. Most computers will support one of these. For the Apple II, you need a printer card. The TRS-80 Model III has a parallel port built in, and the dual disk version comes with a serial port as well. The Model I expansion interface has a parallel port, with a serial board available, and it is also possible to get a parallel cable that will work without the expansion interface. With the Atari computers, you should have their expansion interface, although it is possible to buy a cable from Macrotronics that will plug directly into the joystick ports. The PET and CBM present a problem, as they require an IEE 488 interface, which few printers offer. Most S-100 computers have both parallel and serial boards available. The important thing about interfaces is to be certain that you have everything needed to get your computer to work with your printer.

Noise

Noise is another consideration in choosing a computer. Some printers are so noisy that it is uncomfortable to share an office with them. This is particularly true of letter quality, heavy duty, and high speed printers. Sound proofing and shielding may be available to make it quieter. If you are going to be working in the same room as a printer, I recommend checking out the noise level first. If you select by product specifications, 70 decibels is about as much noise as I would want in an office.

Speed

Printing speed is a subtle feature that is hard to evaluate until it is too late and you have already bought a printer that may be too slow. Creative Computing has a high speed industrial printer hooked up to the PDP 11/34 computer that processes our mailing list. It still takes us 10 hours every month just to print out the mailing labels for the magazine subscribers. I currently have two printers in my office, sitting back to back. The Vista V300-25 is for letters. At 25 characters per second, it is much too slow for line listings or proofreading copies of my articles, so I use the Centronics 779 with a lower case kit for most printouts. My converted Selectric typewriter at home, with a print speed of 15 characters per second, is so slow that I usually bring most things to work to print them out. In general, anything below 60 characters per second is very slow, up to 100 characters per second is slow, and over 600 lines per minute is fast. However, it is hard to compare speed by specifications. A 25 cps Vista printer is actually faster than a 55 cps NEC Spinwriter on some material. Some printers, like the Epson series, have a logic seeking feature so that the printer ignores blank spaces for faster printing.

Size

Another sometimes overlooked printer feature is size. For the last three years, in three houses, my computers have taken over a full room of my house. Even at that, there is little table space. It can be hard finding a place for a 7" by 10" by 3" Radio Shack Quick Printer II, much less a 17" by 25" by 9" C. Itoh Starwriter. Then you have to find room for the paper. The weight is also important. If you move a printer often, a 15 lb. Epson MX-80 is a lot easier to work with than a 60 lb. NEC Spinwriter.

> ***A printer that won't work with your computer is simply an expensive paper weight or boat anchor.***

Special Features and Graphics

Many printers offer special features. Some are just imitations of the things that can be done with a typewriter, such as underlining, superscripts, and subscripts. Other features such as boldface and double size or condensed characters go beyond the abilities of a typewriter. Then there are special features to increase speed and convenience, such as bidirectional printing and a memory buffer to hold characters yet to be printed. If you need special character sets, they are available for many printers, and some printers even allow you to define your own characters.

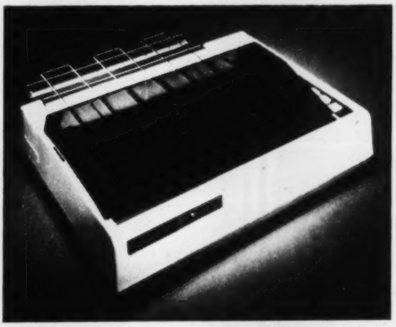
Graphics are another special feature of many printers. Graphics abilities on different printers range from the inclusion of the TRS-80 Models I and III graphics characters on several Epson printers and PET graphics characters on the CBM 2023 printer to the high resolution, high quality, dot-oriented graphics on Integral Data's Paper Tiger series to full color graphics on several printers in the $5,000 price range.

Service

I would not recommend buying any printer before you ask about service. Some companies charge $200 just to look at your printer, with parts and time over two hours extra. There is also an unfortunate tendency in the computer industry to blame all problems on the other parts of the system. The guy who wrote the software blames the guy who designed the computer, who points the finger back at the programmer. The company that builds the printer often blames both. My converted Selectric typewriter is a nightmare to service, because it was built by two different companies, and I don't know where to turn first. On top of that, it needs service constantly at $50 to $75 per call. My estimate is that I have spent 3 cents per page printed on maintenance for the SelectraPrint, while *Creative Computing* has printed out 20,000 pages on three Epson printers without a single service call. Epson claims print head life of 100 million characters and you can replace the head for $30. They also claim a mean time between failures of 5 million lines and a return rate less than 1/2 of one percent.

I would also stay away from any company that seems unwilling to offer advice about interfacing. A printer that won't work with your computer is simply an expensive paper weight or boat anchor.

The one factor that puts all the others in perspective is cost. If all you need is a cheap printer to check your line listings, expect to pay from $100 to $400. A good quality, quiet, dot matrix printer (remember to look for lower case with true descenders) will cost $500 to $1100. Good, dot addressable graphics printers cost $1,000 to $2,000. High speed dot matrix printers cost from $2,500 to $3,500. Letter quality printers start just under $2,000 and range upward



The Epson MX-80F/T.

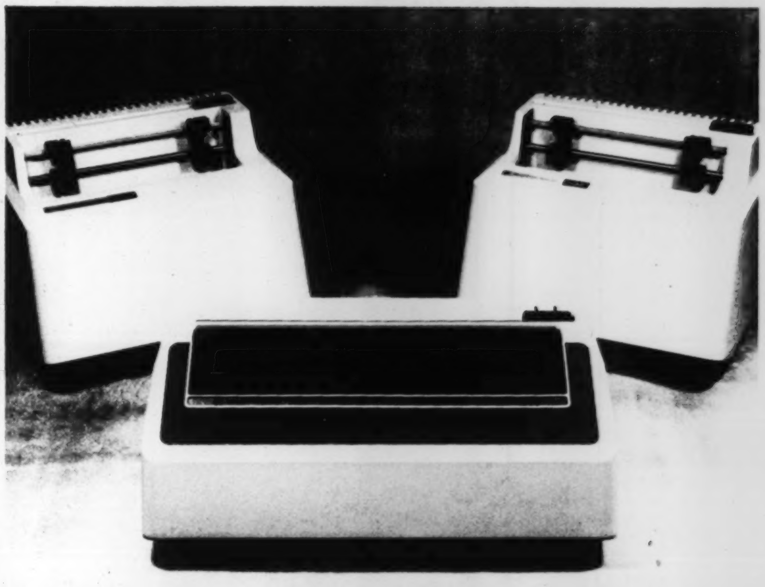
past $4,000. Color graphics printers start around $5,000.

Consider the cost of supplies when you are purchasing a printer, too. If you save $200 by buying an electrostatic printer, then spend 2 cents a copy extra on special paper, then spend 20 cents a copy at the local copy center making readable photocopies to send to other people, you haven't saved much. Thermal paper is also expensive. We pay $4.50 for a 90' roll of paper for our Apple Silentype Printer, about 5 cents a page. Ribbons can also be expensive, ranging from $1.50 for a long lasting typewriter ribbon for our Atari 820 printer to $6.95 for a ribbon for a Centronics printer good for about 20 very sharp pages (for magazine listings) or 2000 pages with the last few barely readable. Epson claims a ribbon life of 3 million characters. On letter quality printers, the ribbons can get very expensive. I pay $3 each for carbon film ribbons that last about 20 pages for my SelectraPrint, though most of the time I use cheaper cloth ribbons.

Creative Computing covered a large number of printers in the July 1981 issue, with a comparison chart of features. The following list includes printers which have lower case descenders, take both tractor feed and single sheet paper, and offer graphics. The Axiom printer is also listed for its unique ability to read the television signal instead of using a printer port.

Abbreviations:
cpi = characters per inch
cps = characters per second
dpi = dots per inch (graphics)
lpm = lines per minute
hor. = horizontal
ver. = vertical

Epson MX-80FT $745
MX-100 $995
Impact dot matrix
Plain paper, tractor and rubber platen, 80 cps
5, 8.25, 10, and 16.5 cpi Bidirectional Print
Parallel interface standard
Add for interfaces and cable: Apple $110, TRS-80 $35 (cable for expansion interface), PET (IEE-488) $80, RS 232 $100 (with 2K buffer $175)
MX-80F/T
40, 66, 80, and 132 columns (depending on character size)
46 lpm with 80 characters (with 20 characters, 105 lpm)
15" x 12" x 5", 16 lbs.
TRS-80 style character graphics
MX-100
68, 116, 136, 233 columns
29 lpm with 136 characters
23" x 13" x 5", 21 lbs.
Dot addressable graphics, 60 dpi standard, 120 dpi double density.



The Integral Data Systems 460, 560 and 445.

Epson America
23844 Hawthorne Blvd.
Torrance, CA 90505

Centronics Model 739 $995
Impact dot matrix
8 1/2" plain paper
Friction or pin feed
80 to 132 columns (10 - 16.7 cpi)
100 cps monospaced
80 cps proportional
Dot addressable graphics: 74 dpi hor. by 72 dpi ver.
Parallel interface
RS-232C interface with 2K memory buffer available for $50 additional.
Acoustic cover

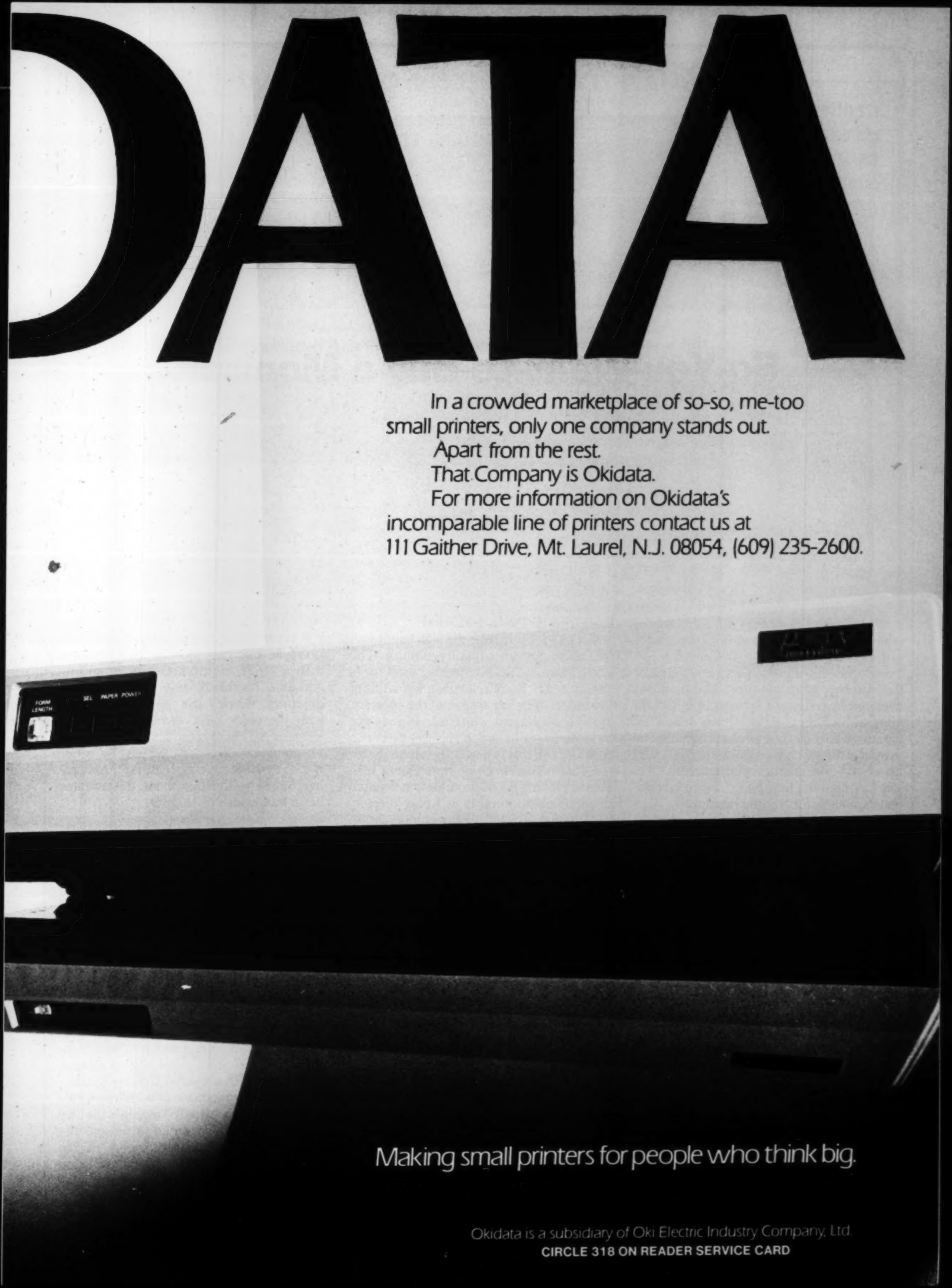
Centronics
Hudson, NH 03051

Microline 82A (not 82!) $799
83A (not 83!) $1195
84 $1495
Impact dot matrix
5, 8.3, 10, 12, 16.5 cpi
Parallel and serial interfaces
Current loop and IEE-488 (PET) interfaces at extra cost
200 million character print head
82A - 8 1/2" plain paper 80 columns
size 14" x 13" x 5"
83A and **84** 15" paper 136 columns
size 20" x 13" x 5"
82A and **83A** print at 120 cps
Pin and friction feed
TRS-80 style block graphics
84 prints at 200 cps
Tractor and friction feed
72 hor. by 72 ver. dot addressable graphics
Okidata
111 Gaither Drive
Mt. Laurel, NJ 08054

Integral Data Paper Tiger 460 $1395
560 $1695
Impact dot matrix
460 - 1 1/4" to 9 1/2" plain paper
560 - 1 1/4" to 14 1/4"
Tractor feed (Tiger Trax single sheet holder $17 extra)
460 has 80 columns
560 has 132 columns
10, 12, 16.8 CPI
Lower case with descenders
84 dpi hor. & ver. Graphics.
RS 232 and parallel interface
560 has acoustic cover
Integral Data Systems
Milford NH 03055

Axiom EX-850 Video Printer $1495
Electrostatic dot matrix
5" aluminized roll paper
Friction feed
Takes standard video input and prints exactly what is on the television screen
350 - 650 dots per line hor.
480 - 510 lines ver.
Picture size 3.78 x 5 (normal) 3.78 x 10 (high res.)
Speed 13.5 seconds per screen normal, 27 seconds high resolution.
12 x 16 x 4 inches, 16 lbs.
Axiom
1014 Griswold Ave.
San Fernando, CA 91340

OKI
OWER
LINE FEED
μ 82A
microline



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CIRCLE 318 ON READER SERVICE CARD

creative
computing
equipment
evaluation

So You Want to Buy a Monitor

George Blank

The Great Monitor War took place about 9 months ago. Creative Computing's software department then had seven color computers, six television sets, and a Texas Instruments color monitor. The monitor went from system to system, in constant demand. There were times when it appeared that any one of our programmers would willingly have committed murder to obtain the monitor permanently. We decided that the time had come to investigate the monitors on the market.

We have used one RGB color monitor from NEC; four NTSC color monitors from Texas Instruments, Heath/Zenith, Amdek, and Videcon; two black and white monitors from Leedex and Radio Shack; a green phosphor monitor from BMC; and the television set sold for use with the Radio Shack Color Computer; as well as several ordinary color and black and white television sets.

Monitors provide significant advantages over TV sets, particularly when reading text. On a monitor, individual characters were much sharper and better defined than on a television set. The difference on NTSC color graphics was not nearly as pronounced, though the RGB monitor was outstanding. The difference between individual NTSC color monitors was not very significant, though our staff had a clear favorite. A technical discussion of the differences between a monitor and a television set appears separately with this article.

Radio Shack Model I Monitor

Not all monitors have the high bandwidth that characterizes a quality monitor. The Radio Shack TRS-80 Model I monitor is simply a 12" RCA television set without the tuner, the wave trap, and the speaker. Since a black and white signal does not have to carry as much information as a color signal, this is perfectly adequate for the Radio Shack computer. But it also means that a TRS-80 monitor is not suited to other computers. It will plug directly into the monitor output port on the Atari, but the picture is the worst I have ever seen on my Atari—even worse than cheap television sets.

Leedex Video 100

Another popular black and white monitor, the Leedex Video 100, is suitable for use with color computers. It gives clear and readable text. However, it is not suited for computers that output sound through the television speaker, such as the Atari and the Texas Instruments 99/4, since it has no speaker. The difference between this monitor and a television set is not great. Text on the $69 Bohsei television set I use with my Atari is almost as good, and the Bohsei has sound.

BMC KG12C Green Phosphor Monitor

The sharpest, clearest monitor I have used is the green phosphor BMC monitor we purchased with our LNW 80 computer. Actually, it is only sharp and clear when it is receiving the right video signal. The LNW 80 has two monitor outputs, one with a NTSC signal for color monitors, and one for black and white (green?) monitors. When I use the BMC monitor with the color port, the signal is much less clear. This suggests that it would not be good for an Atari, Apple, or other NTSC signal producing computer. According to the specification sheet, this monitor has a bandwidth of 18 mHz.

Heath/Zenith and TI Color Monitor

It is the color monitors that really stand out. Of the four NTSC monitors we have, the Texas Instruments and Heath/Zenith appear to be identical except for the nameplate. The color scheme is black and silver—well matched to the TI 99/4. We have given the TI monitor several months of rugged and constant service, taking it to computer shows and carrying it from system to system, with no ill effects other than cosmetic. The pictures are clear and sharp, and our programmers have no complaints about it. The adjustment controls are located behind a panel on the top of the set, and are easy to use.

Texas Instruments has withdrawn this monitor in favor of a 10" monitor that we have not tested. They cite as reasons the lower price and clearer display of the smaller set. The specifications are listed on the chart. The original monitor may still be purchased from Heath.

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Special of the Month!

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INTERFACES: IEEE $55, TRS-80 $35,
APPLE INTERFACE & CABLE $90,
RS-232 $70

EPSON MX-80FT	$599
MX-100FT	$769

$469

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OKIDATA MICROLINE-83	$ 769
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TELEVIDEO 920C	$ 729
TELEVIDEO 950	$ 959
CBM 8032 COMPUTER	$1225
CBM 8050 DISK DRIVE	$1449
CBM 4032 COMPUTER	$1090
CBM 4040 DISK DRIVE	$1090
CBM 4022	$ 679
CBM VIC-20	$ 289
CBM C2N	$ 85
RADIO SHACK II 64K	$3245
RADIO SHACK III 16K	$ 839
LEEDEX/AMDEK 100	$ 139
LEEDEX/AMDEK 100G	$ 169
LEEDEX/AMDEK COLOR-1 13" Color Monitor	$ 349
MICROTEK 16K RAMBOARD for Atari	$99.95
MICROTEK 32K	$ 165
ATARI 400 16K	$ 349
ATARI 825 PRINTER	$ 619
ATARI 850 INTERFACE	$ 139
or both together	$ 749
ATARI 810 DISK DRIVE	$ 449
ATARI 800 32K	$ 769
Call for price list of ATARI software	
NEC 12" MONITOR	$ 229

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Cumberland, RI 02864
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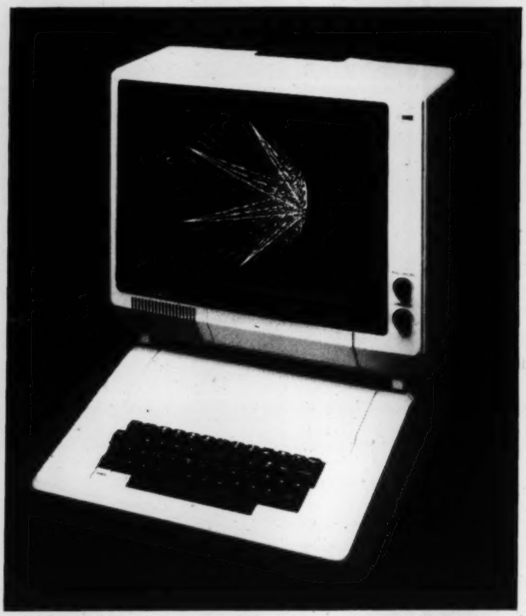
CIRCLE 213 ON READER SERVICE CARD

The TI/Heath/Zenith Monitor.



Amdek's Color II monitor is an RGB version of the Color 1.

Amdek Color Monitor

Our staff's favorite monitor is the Amdek. It has picture quality about the same as the Heath, but it is smaller and lighter with the same 13" diagonal picture. It is attractively styled in a beige color that matches the Apple and is a little lighter than the Atari. This one has had about three months intensive use—again without problems. The adjustment controls are hidden behind a panel on the front of the set below the screen, a very convenient location that is easier to use than the Heath monitor.

Videcon Monitor/Television Set

The Videcon is a combination TV set and monitor. Like the other color monitors, it has a 13" diagonal picture. This seems to be about the ideal for computer use, for reasons related to the bandwidth. Since the number of dots on a screen is limited, a single dot on a larger set has to cover a wider area, and this tends to give a fuzzy picture, while a smaller screen can give much sharper and more distinct characters with the same number of dots. This is the secret of the clear display on the tiny monitor of the IBM 5110 computer. The Videcon seems to have a somewhat lower picture quality than the other monitors, only slightly better than a good color television. The controls are on the front and, with slide controls for color and tint, are even easier to use than the other monitors. Unfortunately, we have not been as satisfied with the colors obtained.

The NEC 8043 Character Display

The best color monitor we have used is the 12" RGB monitor that came with our NEC computer. Of course, the comparison is unfair, as this monitor is much more expensive, and has direct video input for each color, and cannot be used with the Apple, Atari, TI 99/4, and other NTSC computers. The color is clear and sharp, does not bleed into the other colors on the screen, and does not need tint and color adjustment.

Radio Shack's TRS-80 Color Video Set

The 13" television set that Radio Shack sells for use with their TRS-80 Color Computer appears to be a repackaged RCA XL-100. It does not have a monitor input jack, and can only accept a broadcast video signal. The picture is of good quality, only slightly less adequate than the Videcon monitor. I have not been able to determine whether it is in fact a standard XL-100 set or whether it has been modified for computer use. It is attractive, and with digital controls, looks especially good with the TRS-80 Color Computer. We have also enjoyed using it with the Apple and Atari.

The Poor Man's Monitor

If you are not satisfied with the readability of your television set when typing text on your computer, there is another option. Several manufacturers sell green filters that go over your television screen. I consider them a significant help in making the screen easier to read and in reducing eyestrain from long periods at the computer. I would automatically equip any black and white monitor with one, and even like to keep one hinged on tape above a color set when I am typing in programs on the Atari and Apple. I just lift up the screen when I want to check the colors, or when I am using a program with graphics. My own set at home has one, and I have equipped our TRS-80 Models I and III at Creative Computing with green screens.

There are several different types, including some cut and shaped to fit the screen of the computer, some made of flexible film with a frame, and my favorite, the Green Screen, $19.95 from Quality Software Distributors, 11500 Stemmons Expressway, Suite 104, Dallas, TX 75229. It is made of thick hard plastic with beveled edges and held on with double sided tape. The green screen, designed for use with the TRS-80, comes in two sizes. The Model I version is 11" x 8 5/8" while the Model III version is 11 1/4" x 8 3/4". If you are using them with another monitor or television, check to see that they will fit and that you have a flat surface for them. Because this one is thick, solid plastic, it is the only one I recommend for use with a color set where you will have to remove it frequently. You can either hang it from the top of your set with a piece of tape or build a small track for it to slide into.

80 COLUMN GRAPHICS

commodore
CBM
Model 8032
computer

The Integrated Visible Memory for the PET has now been redesigned for the new 12" screen 80 column and forthcoming 40 column PET computers from Commodore. Like earlier MTU units, the new K-1008-43 package mounts inside the PET case for total protection. To make the power and flexibility of the 320 by 200 bit mapped pixel graphics display easily accessible, we have designed the Keyword Graphic Program. This adds 45 graphics commands to Commodore BASIC. If you have been waiting for easy to use, high resolution graphics for your PET, isn't it time you called MTU?

K-1008-43M Manual only $10 (credited toward purchase)
k-1008-43 Complete ready to install package $495

Mastercharge and Visa accepted

Write or call today for our full line catalog describing all MTU 6502 products, including our high speed 8" Floppy Disk Controller for up to 4 megabytes of PET storage.

The image on the screen was created by the program below.

```
 10 VISMEM: CLEAR
 20 P=160: Q=100
 30 XP=144: XR=1.5*3.1415927
 40 YP=56: YR=1: ZP=64
 50 XF=XR/XP: YF=YP/YR: ZF=XR/ZP
 60 FOR ZI=-Q TO Q-1
 70 IF ZI<-ZP OR ZI>ZP GOTO 150
 80 ZT=ZI*XP/ZP: ZZ=ZI
 90 XL=INT(.5+SQR(XP*XP-ZT*ZT))
100 FOR XI=-XL TO XL
110 XT=SQR(XI*XI+ZT*ZT)*XF: XX=XI
120 YY=(SIN(XT)+.4*SIN(3*XT))*YF
130 GOSUB 170
140 NEXT XI
150 NEXT ZI
160 STOP
170 X1=XX+ZZ+P
180 Y1=YY-ZZ+Q
190 GMODE 1: MOVE X1,Y1: WRPIX
200 IF Y1=0 GOTO 220
210 GMODE 2: LINE X1,Y1-1,X1,0
220 RETURN
```

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NOW 80 COLUMN PETS CAN HAVE MTU HIGH RESOLUTION GRAPHICS

CIRCLE 224 ON READER SERVICE CARD

Comparison Chart— Video Monitors and Television Sets

Model	**GDZ 1320**	**PHA 4100**	**Color 1**	**Videcon TC700**
Type	Monitor	Monitor	Monitor	Monitor/TV
Price	$399.95	$374	$449	$399
Size	13"	10"	13"	13"
Color	Excellent	Yes - Untested	Excellent	Very Good
Text	Sharp	Untested	Sharp	Sharp
Size (WxHxD)	20" x 13" x 13"	Unknown	17" x 11" x 13"	18" x 15" x 12"
Weight	38 lbs.	Unknown	26 lbs.	33 lbs.
Speaker	Yes	Yes	Yes	Yes
Manufacturer	Heath Benton Harbor, MI 49022	Texas Instruments Consumer Electronics P.O. Box 53 Lubbock, TX 79408	Amdek 2420 E. Oakton Suite E Arlington Heights, IL 60005	Video Marketing Box 339 Warrington, PA 18976

What Is the Difference Between a TV and a Monitor?

The difference between television sets and monitors is related to the amount of information each one can handle. The information roughly corresponds to dots on the screen, but shows up as a clearer or sharper image. Actually, whether you are using a monitor or a television set to receive a signal, you are getting the same amount of information from the Apple II, the Atari, or the TI 99/4. For some computers, including the NEC, which are not made to work with television sets, this is not true.

The number of bits of information that can be displayed on the screen is dependent on the modulation frequency of the signal coming into the set. A signal with a very high frequency has a lot of information, while a signal with a low frequency has very little.

Frequency is simply the number of times each second that an event occurs. If you think of a highway tunnel that can allow 10 cars to pass through each second, that tunnel has a frequency of ten. In an electrical circuit, instead of cars, we deal with electrical cycles. An electrical cycle is a change from no current to a current going in one direction to no current to a current going in the other direction and back to no current in the line. In United States electric current, this takes place 60 times a second, giving us 60 cycle current. Sixty cycle current has a frequency of 60. Today this is known as 60 Hertz. Your AM radio receives radio waves with a frequency of thousands of cycles each second. Your FM radio and your television set receive frequencies of millions of cycles each second.

However, there are two frequencies involved in a radio or television signal. The first is the carrier frequency. This is the basic signal that you think of as the location to which you tune on the dial. The carrier frequency is not supposed to change, so that you can always find the same station at the same place on the radio or television dial.

The second frequency in a broadcast signal is the information that is placed on the carrier frequency. For example, an audio speaker can vibrate several thousand times a second. One way to get it to do that is to send a signal that changes several thousand times a second to an electromagnet that attracts a magnet attached to the paper speaker cone and causes it to vibrate. This in turn causes the air around it to vibrate, which makes our eardrums vibrate, and we hear those vibrations as music or speech. This information is placed on the carrier frequency by a process called modulation, which simply means changing the frequency. There are several forms of modulation, but let us keep it simple and just think of changing the frequency. The musical note "A", used as a reference frequency for tuning an orchestra, is a pure tone at a frequency of 440 cycles per second. If we wanted to send that tone to a radio tuned to a carrier frequency of one million cycles per second, one way to do it would be to change the one million cycle frequency back and forth by 440 cycles per second. Thus the mixture of our carrier frequency would have a frequency that varied instantaneously from 999,560 cycles per second to 1,000,440 cycles per second. The radio, tuned to the carrier frequency, has circuits that remove the carrier frequency, separate out the modulation (information) frequency, boost the power of the signal, and send it to the speakers. This is called frequency modulation (FM) and is the method used for TV broadcasting.

Note one particular feature of this explanation. While our carrier frequency was 1,000,000 cycles per second, the signal sent actually varied from this by 440 cycles in each direction, from 999,560 to 1,000,440 cycles per second. In order to avoid conflicts, we could not allow any other strong signals anywhere in that frequency range. The size of this signal, 440 cycles below the carrier frequency to 440 cycles above the carrier frequency, or 880 cycles, is called the bandwidth. A radio or television station must be protected against strong competing signals within the entire bandwidth it uses at the extremes of its frequency range. Thus, if our radio station was transmitting music with high notes that reached 30,000 cycles per second, there could be no other station between 970,000 and 1,030,000 cycles per second. The government has decided how much space

JC 1202DH	KG-12C	TRS-80 Color Video	Video 100	TRS-80 Video Display
RGB Monitor	Green Monitor	Television	Monitor	Monitor
$1195	$280	$399	$179	$149.95
12"	12"	13"	12"	12"
Outstanding	(Green)	Good	Black & White	Black & White
Excellent	Excellent	Clear	Clear	TRS-80 only
14" x 12" x 16"	12" x 11" x 11"	21" x 12" x 17"	17" x 11" x 11"	17" x 12" x 13"
28 lbs.	16 lbs.	28 lbs.	18 lbs.	18 lbs.
Yes	No	Yes	No	No
NEC 1401 Estes Ave. Elk Grove Village, IL 60007	BMC International 11222 La Cienaga Inglewood, CA 90304	Radio Shack Ft. Worth, TX 76102	Amdek 2420 E. Oakton Suite E Arlington Heights, IL 60005	Radio Shack Ft. Worth, TX 76102

on the frequency spectrum to allow to each kind of station, and requires them to limit their signal to their authorized bandwidth. This leads to a political decision. If we have wide bandwidths that allow a lot of information to be sent, we can only have a few stations. If we have many stations, we have to limit the amount of information transmitted. The government has decided how many stations to allow and has placed limits on the bandwidth of each signal allowed.

In the case of television, not only the audio (sound) signal, but also the video (picture) signal is carried by modulation. Since a television set displays a complete picture on the screen 60 times each second (this is done to avoid "flickering" and give the appearance of a steady picture and smooth motion), we are limited to displaying on a television screen the amount of information that can be sent in 1/60th of a second. The government has allocated a bandwidth of 4.2 megaHertz (4,200,000 cycles per second) for each television station. Part of that is for audio and part is for video information. The video signal is allowed 3.57 megaHertz, or 3,570,000 cycles per second.

If we divide this by 60, we get a potential resolution on the screen of about 59,500 different dots that can be turned on or off. Unfortunately there are further limits. First, we need to use part of the information stream to tell the television when it has reached the end of a line, so it can go back to start the next one, and then we need to tell the television when it has reached the bottom of the screen, so it can go back to the top. In addition, since we have no way to store information in the television, it makes no sense to send information while the television is getting ready to display information at the next line or page. A further restriction is imposed by overscan. If you have watched movies on television, you may have noticed that the edges of the picture are lost. This is done deliberately to avoid annoying black edges around the picture. Actually, about 20% of the signal is lost to overscan around the top, bottom, and sides of the screen.

What this all means, in practical terms, is that a computer designed to work with a television set can only display a limited amount of information on the screen. American television sets have circuitry called a wave trap that cuts out any signal above and below the authorized 3.57 megaHertz to avoid interference from other channels. This is why the Apple and the Atari are limited to a 40 character screen width, and even at that, the letters are fuzzy and poorly defined. It is simply not possible to send much more information to a standard television because of the wave trap.

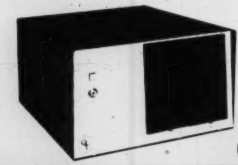
In designing a television set, one designs it to handle the amount of information with which it will be used, adding a comfortable margin to allow for the aging of the parts used and small defects and variations in manufacture. In the case of most television sets, that means that even if you bypass the wave trap, the set can only handle about a 5 megaHertz signal. The very best television sets can probably handle 10 to 12 megaHertz signals. Even though we send a lower frequency signal than that, we want a set that can handle a higher frequency because it will locate our signal more precisely on the screen and give us a clearer picture. This is why some television sets have better pictures than others.

In addition, when you send information to a television set through the antenna circuitry, you have to superimpose the information on a 3.57 megaHertz carrier wave at the computer and then allow the television set circuitry to strip the information back off for display. Each circuit distorts the signal a little, so you do not get the quality picture you would get if you bypassed both operations.

All this is to say that monitors can have two advantages over television sets. They can be designed to handle signals with a wider bandwidth than a television needs, and they can bypass the conversion of the digital information to a broadcast frequency and back again. Actually, the Apple II, the Atari, and the TI 99/4 all use NTSC or composite video, which means that the advantage of bypassing the extra conversions is lost. In fact, of the monitors discussed here, only the NEC can handle the other type of signal, which is known as RGB for Red-Green-Blue, designating the separate signals for each color. Few popular computers put out an RGB signal. Among the ones that do are the NEC, the Apple III, the LNW, and the Cromemco. It is the higher bandwidth that makes a monitor more expensive than a television set. ☐

QT
COMPUTER
SYSTEMS
INC.

15620 South Inglewood Avenue
Lawndale, California 90260
(213) 970-0952



SYSTEM+
(8″)

MINI-
SYSTEM+
(5¼″)

QT SYSTEM +

The QT System+ is designed for both businessmen and engineers in accordance with the latest IEEE standards. Among other functions, it can be used for accounting and word processing, as well as a variety of scientific applications. The system will soon be available with MP/M® to allow multiuser, multi-tasking operations. This means, for example, that an engineer could be working on scientific applications in the lab while an accountant is writing payroll checks in the office. QT also offers a full line of business and applications software, ranging from a business package to word processing.

Technical specifications: 4MHz Z-80A CPU • Dbl-sided, dbl-den. 5¼″ & 8″ floppy disk controller (handles both drives simultaneously) • Two 8″ dbl-den., sgl. or dual sided disk drives, expandable to 4 floppy drives • CP/M® 2.2 included • 64K RAM • Comes complete in single mainframe • EPROM/ROM in any combination to 8K • Two RS232C serial I/O ports • Two parallel I/O parts • Hard disk compatible • Real time clock • Std. 2K monitor program & disk routines included on ROM • Power-on/Reset jump to monitor program • 2716 (5V) EPROM programmer (software incl. on monitor ROM)(ext. 25.5V @ 50ma req.) • Uses Z-80A CPU vectored interrupts • Assembled, tested & burned • Documentation included.

With Terminal 920C Add $900.00

SYSTEM + I (1MB+)

SYS+SS Computer System with 8″ Single Sided Drives (801R) without Terminal

A&T (6 slot)	**$3595.00**
A&T (8 slot)	**$3695.00**
A&T (12 slot)	**$3795.00**

SYSTEM + II (2MB+)

SYS+DS Computer System with 8″ Dual-Sided Drives (Qume DT-8) without Terminal

A&T (6 slot)	**$4495.00**
A&T (8 slot)	**$4595.00**
A&T (12 slot)	**$4695.00**

MINI-SYSTEM + I (½MB+)

Computer System with 5¼″ Single Sided Drives (uses B-51 Disk Drives) No Terminal

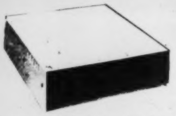
A&T (6 slot)	**$2495.00**
A&T (8 slot)	**$2595.00**
A&T (12 slot)	**$2695.00**

MINI-SYSTEM + II (1MB+)

Computer System with 5¼″ Double Sided Drives (uses B-52 Disk Drives) No Terminal

A&T (6 slot)	**$2795.00**
A&T (8 slot)	**$2895.00**
A&T (12 slot)	**$2995.00**

DISK DRIVE PRODUCTS



QT DISK PACKAGES

DDC-88-1	Dbl Den Controller, A&T, two 8″ dbl den drives (801R) CP/M® 2.2 cabinet, power supply & cables	**SPECIAL $1495.00**
DDC-88-2	Two 801R disk drives with cabinet, power supply, fan & cables	**$1200.00**
DDC-88-22	Two DT-8 Qume drives with cabinet, power supply, fan & cables	**$1600.00**
DDC-88-3	Cabinet with power supply, fans & cables	**$ 275.00**
DDC-88-4	Cabinet only	**$ 75.00**

DISK DRIVES

8″

Shugart 801R Sgl/Sided Dbl/Den	**$ 450.00**
Qume Datatrak 8″ Dbl/Den QME-8DS (851R)compatible	**$ 650.00**
Pkg of two	**$1250.00**

5¼″

MPI-B51 MPI B-51 Sgl Sided Sgl/Dbl Den	**$ 235.00**
MPI-B52 MPI B-52 Sgl Sided, Dbl Den	**$350.00**
MPI-B91 MPI B-91 Sgl Sided, Dbl Den, 77 tracks	**$ 375.00**
Shugart SA400 SHU-SA400 Sgl Sided, Dbl/Den	**$ 250.00**

S-100 PRODUCTS

Double Density - Cal Comp Sys

5¼″ or 8″ disk controller with free CP/M 2.2

CCS-2422A A&T	**$374.95**

Expando RAM II - SD Systems

4 MHz RAM board expandable from 16K to 256K

SDS-RAM216K 16K kit	**$289.95**
SDS-RAM216AT 16K A&T	**$339.95**
SDS-RAM232K 32K kit	**$329.95**
SDS-RAM232AT 32K A&T	**$379.95**
SDS-RAM248K 48K kit	**$369.95**
SDS-RAM248AT 48K A&T	**$419.95**
SDS-RAM264K 64K kit	**$409.95**
SDS-RAM264K 64K A&T	**$459.95**

PROM-100 - SD Systems

2708, 2716, 2732, 2758 & 2516 EPROM programmer

SDS-PROM-100K kit	**$220.00**
SDS-PROM-100AT A&T	**$275.00**

ITHACA AUDIO REV 2.0 Z-80 BD

Bare Board .... **$35.00 each**

10 for $300.00

SEALS ELECTRONICS 32K STATIC BD

Uses TMS-4044 or 5257L ...... **$35.00 each**

QT MEMORY EXPANSION KITS

TRS-80 • APPLE • EXIDY

4116 200 ns	**8 for $32.00**
2716 (5V-450 ns)	**$ 9.00**
2716 (5 & 12V-450 ns)	**$ 9.00**
2732 (5V)	**$40.00**
2114L 300 ns	**8 for $36.00**
	100 - $3.50 ea.

PARTS

MICROPROCESSORS

Z80 (2MHz)	$10.95
Z80A (4MHz)	$12.95
6502	$11.25
6800	$12.50
6802	$18.00
8035	$20.00
8080A	$ 3.50
8085A	$20.00
8086-4	$60.00
8088	$60.00
8748	$60.00
TMS 9900 JL	$29.95

8080A SUPPORT

8212	$ 3.50
8214	$ 4.50
8216	$ 2.95
8224	$ 4.00
8228	$ 6.00
8238	$ 6.00
8243	$ 5.00
8251	$ 7.00
8253	$19.00
8253-5	$20.25
8255	$ 6.25
8257	$17.95
8257-5	$19.00
8259	$19.95
8275	$69.95
8279	$17.50
8279-5	$18.00
8295	$16.50

KEYBOARD CHIPS

AY5-2376	$13.75
AY5-3600	$13.75

BAUD RATE GENERATORS

MC14411	$11.00
1.8432 XTAL	$ 4.95

DISK CONTROLLER

1771B01	$24.95
1791B01(CER)	$37.95

EPROMS

1702A	$ 4.95
2708	$ 6.25
2516 (5V)	$ 9.00
2716 (5V)	$ 9.00
2716 (5 & 12V)	$ 9.00
2758	$19.95
2532	$40.00
2732	$40.00

USRT

S2350	$ 7.95

MISCELLANEOUS OTHER COMPONENTS

N8T20	$ 3.25
N8T26	$ 2.50
N8T97	$ 2.00
N8T98	$ 2.00
1488	$ 1.25
1489	$ 1.25
D3205	$ 3.00
D3242	$14.00
P3404	$ 6.75
TMS5501	$19.00
DM8131	$ 3.00

UARTS

TR1602B	$ 4.50
AY5-1013A	$ 4.50

CHARACTER GENERATORS

2513 UP CASE (5&12V)	$10.95
2513 LWR CASE (5&12V)	$10.95
2513 UP CASE (5V)	$ 9.75
2513 LWR CASE (5V)	$10.95

6800 PRODUCTS

6802P	$18.00
6821P	$ 5.25
6840P	$18.25
6845P	$22.00
6850P	$ 4.80
6860P	$11.55
6875P	$ 7.40

QT PRODUCTS

SBC+2/4
SINGLE BOARD COMPUTER

Features: 1K RAM (which can be located at any 1K boundary) plus one each Parallel and Serial I/O parts on board • Power on jump to on-board EPROM (2708 or 2716) • EPROM addressable on any 1K or 2K boundary • Full 64K use of RAM allowed in shadow mode • Programmable Baud rate selection, 110-9600 • 2 or 4MHz switch selectable • DMA capability allows MWRT signal generation on CPU board or elsewhere in system under DMA logic or front panel control • Two programmable timers available for use by programs run with the SBC+2/4 (timer output and controls available at parallel I/O connector; parallel input and output ports available for use on CPU board).

Bare Board	$ 60.00
Kit	$190.00
A&T	$295.00

Z+80 CPU

Features: Power on jump to on-board EPROM (2708, 2716 or 2732) • EPROM addressed on any 1K or 2K boundary; also shadow mode allows full 64K use of RAM • On-board USART for Synchronous or Asynchronous RS-232 Operation (Serial I/O port) • Programmable Baud rate selection, 110-9600 • Switch selectable 2 or 4 MHz • MWRITE signal generated if used without front panel • Front panel compatible.

Bare Board	$ 50.00
Kit	$150.00
A&T	$210.00

RAM+16

Features: S-100, 16K x 8 bit static RAM • 2 or 4 MHz • Uses 2114 1K x 4 static RAM chip • 4K step addressable • 1K increment memory protection, from bottom board address up or top down • Deactivates up to six 1K board segments to create "holes" for other devices • DIP switch selectable wait states • Phantom line DIP switch • Eight bank select lines expandable to ½ million byte system • Data, address and control lines all input buffered • Ignores I/O commands at board address.

Bare Board	$ 35.00
4Mhz Kit	$190.00
4Mhz A&T	$225.00

RAM+ 65

•S-100, 16K x 8 bit static RAM •2 or 4MHz •Uses 2114L (300NS) CHIP •Addressable in 4K steps •Memory protection in 1K increments, from bottom board address up or top down • May deactivate up to six 1K segments of board to create "holes" for other devices • DIP switch selectable wait states • Phantom line DIP switch •Features bank selection by I/O instruction using any one of 256 DIP switch-selectable codes—allows up to 256 software-controlled memory banks.

Bare Board	$ 35.00
4MHz Kit	$210.00
4MHz A&T	$250.00

EXPANDABLE+ REV II
DYNAMIC MEMORY BOARD

NEW

Features: Runs at 4MHz • 3242 refresh controller with delay line • Four layer PC board insures quiet operation • Supports 16K, 32K, 48K or 64K of memory • 24 IEEE-specified address lines • Optional M1 wait state allows error free operation with faster processors • Optional Phantom disable • Uses Z-80 or on-board refresh signal • Bank on/off signal selected by industry standard I/O port 40 (Hex) • Convenient DIP switch selection of data bus bits determines bank in use • 3 watts low power consumption • Convenient LED indication of bank in use.

Definitely works with Cromemco and North Star

Bare Board .... $ 75.00

KIT		A&T	
No RAM	$230.00	16K	$350.00
16K	$280.00	32K	$450.00
32K	$360.00	48K	$575.00
48K	$480.00	64K	$675.00
64K	$525.00		

CLOCK/CALENDAR+
FOR APPLE II, S-100 OR TRS-80

Features: Date/Month/Year • Day of week • 24 hour time or 12 hour (a.m./p.m.) selectable • Leap year (perpetual calendar) • 4 interval interrupt timer; 1024Hz (approx. 1 millisec), 1 sec., 1 min., 1 hr. • On-board battery backup • Simple time and date setting • Simple software interface • Time advance protection while reading.

Battery Included

S-100 or Apple		TRS-80	
A&T	$150.00	A&T Only	$150.00
Kit	$100.00		
Bare Bd.	$ 60.00		

WATCH FOR THE FOLLOWING NEW BDS:

- **4 Port Serial Bd (APR)**
- **E-PROM Programmer (MAY)**
- **Floppy Disk Controller (JUN)**
- **Hard Disk Controller (JUN)**
- **Color Video Bd (AUG)**

I/O+
INDUSTRIAL GRADE I/O BD

Has two serial Sync/Async ports (RS-232, current loop or TTL) with individual Xtal controlled programmable baudrate generators • Four 8-bit Parallel ports; one latched input port and other three can be programmed in combinations of input, output or bidirectional • Also, has three 16-bit Programmable Timers and an 8-level Programmable Interrupt Controller w/Auto restart (8080 / Z80) • Other features include; on-board clock divisor for timers, completely socketed, wire wrap posts for easy port configuration plus more.

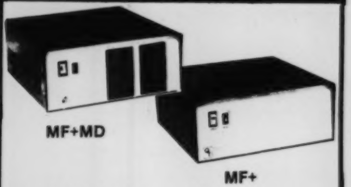
Bare Board	$ 70.00
Kit	$200.00
A&T	$375.00

SILENCE+
MOTHERBOARDS

These motherboards are among the quietest on the market. A unique grounding matrix — with each line completely surrounded by ground shielding — eliminates need for termination and gives high crosstalk rejection • They're customer-proven, without crosstalk sometimes operating at 14MHz • A LED power indicator helps eliminate zapped circuits • IEEE S-100 std. compatible, available with 6, 8, 12, 18 or 22 slots • (The 22 slot board fits Imsai chassis and has slot for front panel.)

6 Slot		12 Slot	
Bare Board	$ 25.00	Bare Board	$ 30.00
Kit	$ 40.00	Kit	$ 70.00
A&T	$ 50.00	A&T	$ 90.00
8 Slot		**18 Slot**	
Bare Board	$ 27.00	Bare Board	$ 50.00
Kit	$ 55.00	Kit	$100.00
A&T	$ 70.00	A&T	$140.00

QT MAINFRAMES



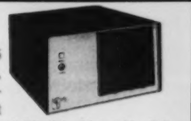
5¼" Disk Mainframe with 25A Pwr Sup

MF+MD12 (12 slot M/B)	$500.00
MF+MD8 (8 slot M/B)	$475.00
MF+MD6 (6 slot M/B)	$450.00
MF+MD w/o M/B	$400.00

Q.T. Mainframe

MF+12 (12 slot M/B)	$450.00
MF+18 (18 slot M/B)	$500.00
MF+22 (22 slot M/B)	$600.00

MAINFRAME+ DISK DRIVE



Includes cabinet, 25 amp power supply, IEEE S-100 compatible 6, 8 or 12 slot motherboard and dual 8" disk drive with disk drive power supply.

MF+DD6	$625.00
MF+DD8	$650.00
MF+DD12	$675.00

DDC-8
SINGLE 8" DISK CABINET

Accepts one 8" disk drive (Shugart, Remex, PerSci, Siemens, etc.) • Fan cooled, with data cable and AC line filter to eliminate EMI • Operates from 100-125VAC/200-250VAC at 50-60Hz • Disk drive NOT included.

DDC+8 .... **$195.00**

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TRS-80 is a trademark of Radio Shack.

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TERMS OF SALE: Cash, checks, money orders, credit cards accepted. Also C.O.D. orders under $100.00. Minimum order $10.00. California residents add 6% sales tax. Minimum shipping and handling charge $3.00. Prices subject to change without notice. International sales in American dollars only.

VISA

So You Want More Memory

Bill Kubeck

If you are like most folks you probably didn't buy your computer with as much memory as it could use. Sooner or later you're bound to want to expand your system. When you do, you will be faced with some choices.

The first thing you must decide is who will actually do the installation. The most direct method is to take the system to the dealer from whom you bought it and say "Fill it up!" This is the simplest method and the best way to go if you just can't face the thought of tinkering with the insides of your computer. It will cost more, though, than doing it yourself. The extra cost is the dealer's fee for the service and support he provides.

If you are willing to do a little homework, however, you can save some money and learn something about your computer at the same time. First, a little basic information about memory.

The working storage area of the computer is called RAM, which stands for Random Access Memory. The essence of RAM is that information can be stored or retrieved in any location independently of anything else stored there.

RAM is usually packaged in the form of integrated circuits or "chips." Each chip has a capacity which is measured as so many "K" bits of data. "K" means "kilo" and when applied to computers represents 1024. Thus, a 16K RAM chip has a capacity of 16 x 1024 or 16,384 bits.

Since the computer deals in 8-bit bytes and the RAM chips are organized in bits, eight RAM chips are required to make a set capable of storing any number of bytes of data. Thus, a 16K memory expansion will consist of a set of eight 16K RAM chips.

There are two important RAM specifications that you must understand in order to be sure you're getting the right chips for your computer.

MEMORY EXPANSION REFERENCE CHART

COMPUTER	RAM type	Chip/ Board	Min/Max RAM cap.	Notes
Apple II & II+	4116	chips	16/48 (64)	1
TRS-80 Model I	4116	chips	4/48	2
TRS-80 Model III	4116	chips	16/48	
TRS-80 Color	4116	chips	16/48	3
Atari 400	4116	board	8/48	
Atari 800	4116	board	8/48	
PET—Old ROM	2114	chips	8/32	4
PET—New ROM	4116	chips	8/32	4
VIC-20	4116	chips	5/8	5

NOTES:

1. Last 16K requires RAMcard or Language system.
2. First 16K in main unit, 32K in expansion interface.
3. Last 32K requires expansion interface.
4. Chips are soldered in.
5. Last 3K requires expansion RAMpack.

The first is "Access Time," which is a measure of how quickly data can be loaded into or taken out of a memory location. Access time is measured in nanoseconds (billionths of a second or ns) and the smaller the number, the faster the chip. Each type of computer has a certain minimum speed it requires of its memory if it is to work properly. Fast memory is more expensive than slower memory, so a bit of care is required to insure the best combination of price and performance.

The second is the difference between "Static" and "Dynamic" RAM. All RAM lose stored information when the computer is shut off. In addition, Dynamic RAM must constantly receive a special "refresh" signal during operation. Computers are very specific regarding which type of RAM they can use and the two types are not interchangeable. Be sure of which type you need for your system.

A certain amount of manual skill and a measure of technical common sense are needed to install memory chips in a computer. The circuit chips used in computers are sensitive to static and memory chips are no exception. The pins on the chips can be bent by improper handling. If a chip is installed incorrectly (like backwards), the computer may be damaged. Some computers must be partially disassembled and this calls for some caution.

These hazards are present anytime you work on a computer but they can be overcome. If you are comfortable working with small tools and take the time to check your work as you go, then you should be able to install memory in your own computer. Your reward for your efforts will be a nice cost savings and a better working knowledge of your system.

Depending on the particular computer, memory chips may be mounted on separate boards or may plug right into the main or "mother" board. There are also special considerations for each type of computer so we will cover each of the popular systems separately.

1. Apple II and II Plus—The Apple has room on the motherboard for a total of 48K. An additional 16K can be added by plugging a special RAMcard or the Apple Language Card into slot 0. This, of course, is in lieu of an Applesoft or Integer card. Don't use anything slower than 250ns memory. 200ns is better.

2. TRS-80 Model I—There is room in the keyboard/CPU unit for a total of 16K. If the unit originally came with 4K, these chips can be replaced with 16K chips. This will require some changing of jumper wires. Upgrade kits specially packaged for changing 4K TRS-80s to 16K will have instructions on how to do this. Further upgrades require the Expansion Interface, which has room for 32K. Memory can be added quite easily by plugging chips into the available sockets and no rewiring is needed.

3. TRS-80 Model III—This system can accommodate a maximum of 48K, which is held in sockets on the main board. Add memory 16K at a time. No rewiring needed.

4. TRS-80 Color Computer—this system is somewhat similar to the old Model I in that a 4K unit can be upgraded to 16K by replacing the chips and changing the jumper. The maximum memory capacity of the computer is 16K. Percom makes an expansion interface for the Color Computer which allows expansion to 48K.

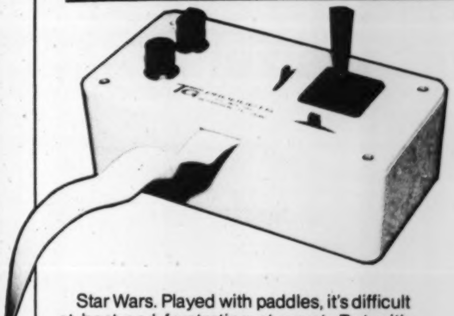
5. Atari 400/800—Atari memory comes in the form of plug-in boards. The 400 can hold one board. This normally means a maximum of 16K RAM although one supplier has a 48K board available. The 800 can hold three RAM boards and can use 48K effectively. It is possible to modify an 8K board to 16K by replacing the chips and changing jumpers.

6. PET—Memory upgrades in the PET are not very easy. The memory chips are soldered in place and Commodore has recently been drilling holes through the circuit boards at unoccupied RAM locations. This makes it necessary to solder in an auxiliary circuit card in order to add memory. Such memory cards are available from vendors other than Commodore.

7. VIC-20—The VIC comes with 5K of memory in the main unit and is not expandable internally. External expansion requires a device but it is not available at present.

8. Sorcerer—Sorcerers come in two sizes: 16K and 32K. All memory is on the main board in sockets and adding 16K is quite simple. ☐

Why would anyone spend $59.95 for a joystick?



Super Joystick

Star Wars. Played with paddles, it's difficult at best and frustrating at worst. But with a joystick it becomes an entirely new experience. It's still challenging. It's also fun. And very addictive.

Have you ever used a drawing program in which one paddle controls the horizontal movement of the "brush" and the other paddle the vertical? It's slow, tedious work. But with a joystick, drawing is an absolute joy.

Exceptional Precision

The Apple high-resolution screen is divided into a matrix of 160 by 280 pixels. To do precise work on this screen, you need a precise device. Most potentiometers used in paddle controls are not quite linear. If you rotate a paddle control at a constant speed, you'll notice that the cursor speeds up slightly at the beginning and end of the paddle rotation.

The Super Joystick has a pure resistive circuit which is absolutely linear within one tenth of one percent. In other words it would give you precise control over an image of 1000 by 1000 pixels, were such resolution available. Thus it is suitable for high precision professional applications as well as educational and hobbyist ones.

Matched to your application

The Super Joystick also has two external trim adjustments, one for each direction. This allows you to perfectly match the unit to your application and computer. Say you want to work in a square area instead of the rectangular screen. Just reduce the horizontal size with the trim control.

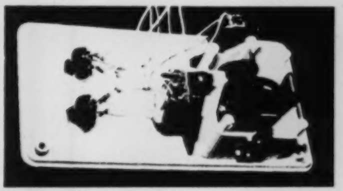
How many times have you played Space Invader and had your thumb ache for hours from the repeated button pressing? This won't happen with the Super Joystick. It's two pushbuttons are big. Moreover, they use massive contact surfaces with a life of well over 1,000,000 contacts. A few games of Super Invader using these big buttons will justify the purchase of the Super Joystick.

The Super Joystick is self-centering in both directions. That means when you take your hand off it, the control will return to the center. However, if you want it to stay where you leave it, self-centering may be easily disabled.

The Super Joystick plugs right into the paddle control socket and doesn't require an I/O slot.

High-quality construction

The sturdy metal case of the Super Joystick matches that of the Apple computer. Every component used is the very highest quality available. The Super Joystick even uses a full 16-conductor ribbon cable so you can add a second joystick if you wish. The first Super Joystick replaces Paddles 0 and 1. You may not realize it, but the Apple can support four paddle controls. A second Super Joystick would replace Paddles 2 and 3.



By removing two springs, self-centering can be defeated.

We invite your comparison of the Super Joystick with any other unit available. Order it and use it for 30 days. If you're not completely satisfied, return it for a prompt and courteous refund plus your return postage. You can't lose.

The Super Joystick consists of a self-centering, linear joystick, two trim controls, and two pushbuttons mounted in an attractive case. It comes complete with an instruction booklet and 90-day limited warranty. Cost is $59.95.

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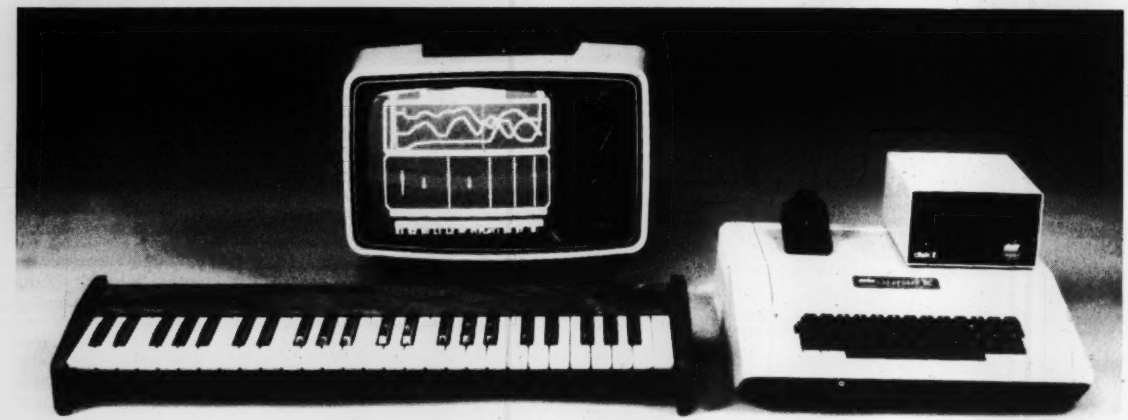
CIRCLE 239 ON READER SERVICE CARD

So You Want To Buy A Music Synthesizer

David Lubar



The Soundchaser could be the wave of the future.

After a few hours at the computer balancing your checkbook, eradicating Klingons, and eavesdropping on the local network, wouldn't it be nice to sit back and let the machine provide a bit of Bach? Computers, with their number crunching abilities, are ideal for controlling synthesizers. In fact, the computer can even go beyond control and perform the synthesis. There is a wide variety of music systems available, ranging from inexpensive devices for hobbyists to extravagant setups suitable for studio work. Of course, your selection will be governed by which computer you own or are planning to buy. Presently, the widest choice is available for the Apple, with the TRS-80 and Atari slowly gaining ground. PET, Sorcerer and TI 99/4 owners will have the narrowest selection from which to choose.

While a record on the hi-fi is a cheaper way to get music, there are many uses for a synthesizer. Beyond just producing music, it can be used by anyone who wants to practice a duet but lacks a willing human partner. Or it can be used as a Music Minus One record. But better than the record, the synthesizer can play slowly when a piece is being learned and the tempo can be increased as proficiency is gained. The synthesizer keeps perfect rhythm, never plays anything it wasn't told to play, and doesn't drink all your beer. If you want to know how a piece of sheet music should sound, and don't have a recording of the piece, a synthesizer is ideal. It is also perfect for composers and anyone else who desires to experiment with music.

Before covering buying strategy, I will consider some background such as types of music systems, what they can and can't do, how they differ, and so on. The majority of systems are based on a synthesizer. As the name suggests, this is a device which, in part, artificially creates the sound of a musical instrument. Beyond this, it can create sounds of imaginary instruments, as well as noises and sound effects. Basically, synthesizers produce a wave which is created by changing voltage in some regular manner. When this voltage is sent to a speaker, a sound is produced. Changing the frequency of the wave changes the pitch of the sound; a faster wave produces a higher note. Changing the amplitude of the wave changes the volume; the greater the amplitude, the louder the sound.

> ***The square wave has an organ-like quality, though it can be manipulated somewhat to simulate other instruments.***

There is more to music than pitch and volume. Characteristics such as timbre are affected by the type of wave produced. For instance, a sine wave has a different quality than a square wave. Most synthesizers produce a square wave. This is a wave which, as opposed to a smoothly curving sine, alternates between two values. To most people, the square wave has an organ-like quality, though it can be manipulated somewhat to simulate other instruments. A good synthesizer can get a great deal of mileage from a square wave. Since the synthesizer does the work of producing the wave, the computer is free to provide all control over pitch and volume. Good synthesizers allow you to control not just the amplitude of the music, but the actual rise and fall of amplitude within the wave producing the note. This is called envelope control, and allows the creation of unique instrument sounds. Another type of system actually creates the waveform in the computer, then sends the signal to a digital-to-analog converter (DAC). The DAC is a fairly simple piece of hardware which takes a number from the computer (a digital input) and translates it into a voltage (an analog output). While systems using DACs allow more control of the waveform, they are limited to fewer voices since the computer must do all calculations.

Voices? That is the slightly confusing term used to refer to a single sound channel, and has nothing to do with speech. A synthesizer that can produce four notes at the same time is said to have four voices. One of the major criteria in selecting a synthesizer is how many voices you

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CIRCLE 226 ON READER SERVICE CARD

Music Synthesizer, continued...

want or need. Interestingly enough, systems offering more voices don't always have higher prices.

While the computer produces the music, the notes have to be entered by a human. This introduces another consideration. Some systems are very easy to use, some are rather difficult. Sound quality is also important. The user with perfect pitch will have different needs than the casual listener.

So, how do you go about selecting the right system. You should first have a good idea of the kind of music you will be entering. If you want to use the synthesizer as a partner for duets, you will need fewer voices than if you are trying to simulate a jazz quintet. Coupled with this, you have to consider which instruments you plan to synthesize. While a flute or clarinet requires only one voice, a piano might need many. Each note in a chord requires a separate voice. With a bit of ingenuity, you can shave these requirements. For instance, though a guitar has six strings, a chord can usually be simulated with four voices by letting the bass fade before the treble begins. Similarly, a guitar and banjo don't necessarily need eleven voices. By swapping channels, using them for whichever instrument is playing the most notes at any point, you can get away with eight or nine voices. Of course, this requires a system which allows voices to be swapped or redefined on a note-by-note basis.

Some synthesizers offer stereo, either sending specific voices to the right or left speaker, or allowing you to define which voice goes to which speaker. This can be important if you are using several voices for one instrument; the instrument shouldn't be split between speakers. A few synthesizers include the ability to produce white noise. This type of sound has a variety of uses, ranging from simulating percussion to adding a bit of realism to flutes by making the sound the player's breath produces when crossing the opening.

If you aren't in the mood to enter your own music, it's nice to have the option of playing existing scores. Some companies offer albums of music for their synthesizers, and a few entrepreneurs are also producing such products.

For those who want music but don't want to spend a great deal of money, there is one other option. Several computers already include hardware for sound generation. The Apple has a limited but usable speaker, and the TI and Atari have internal synthesizers. There is software available which uses this hardware. Texas Instruments and Atari each manufacture a cartridge containing software for entering and playing music.

To sum things up; you should consider number of available voices, ease of entry, sound quality, and price. If you can, try to hear the system before buying it. Some manufacturers sell audio cassettes with sample music, and many computer stores have demonstration models. A list of companies producing music systems is included below.

If you aren't in the mood to enter your own music, it's nice to have the option of playing existing scores.

Representative Music Systems

ALF Apple Music Synthesizer

Two systems available; the AMS has three voices per board, up to three boards per Apple, with two boards required for stereo. Price is $248. The AM-II offers nine voices (three left, three right, and three shared by both speaker cables) for $198, but has less fidelity in the higher ranges. Thus the AMS is aimed at the musician while the AM-II is for the hobbyist. Both use paddles and hi-res graphics for note input, have envelope control, produce square waves, and give a lo-res display of note dynamics during playback. The AM-II has limited white-noise capability. A selection of prerecorded disks is available for each. For more information, contact Peripherals Plus, 39 East Hanover Ave., Morris Plains, NJ 07950. (201) 267-4558.

Mountain Hardware Music System

A sophisticated system employing digital oscillators and programmable waveforms. For $545 you get the music boards (the system comes on two boards that must be placed in adjacent slots in the Apple), software, speaker cables, and a light pen. The light pen is used, along with the paddles, for note entry. There are sixteen voices which can be split among up to four instruments. Instrument definitions are provided on the disk; others can be created by the user. So far, Mountain has done a good job of supplying owners with software and documentation updates. Mountain Computer, Inc. is located at 300 Harvey West Blvd., Santa Cruz, CA 95060.

Soundchaser

Passport Designs has just released a sophisticated system integrating a four-octave keyboard with a powerful synthesizer. The synthesizer offers three voices, oscillators for square and sawtooth waves, a filter, and an audio amplifier. Two boards can be used, giving a six-voice system. Note entry is through the keyboard. Price for one synthesizer and keyboard is $1000. Keyboard alone is $650, synthesizer alone is $350. A complete review of this product will appear in a future issue. Available from Passport Designs, Inc. 785 Main St., Suite E, Half Moon Bay, CA 94019.

Orchestra-80

A DAC that plugs into the TRS-80, offering four voices and control of instrument definitions. Software supplied with the system allows note entry through the keyboard using numbers and letters, and includes a powerful text editor for changing scores. At a price of $79.95, it is one of the best bargains around. The distributor is Software Affair, 473 Sapena Court, Suite 1, Santa Clara, CA 95051.

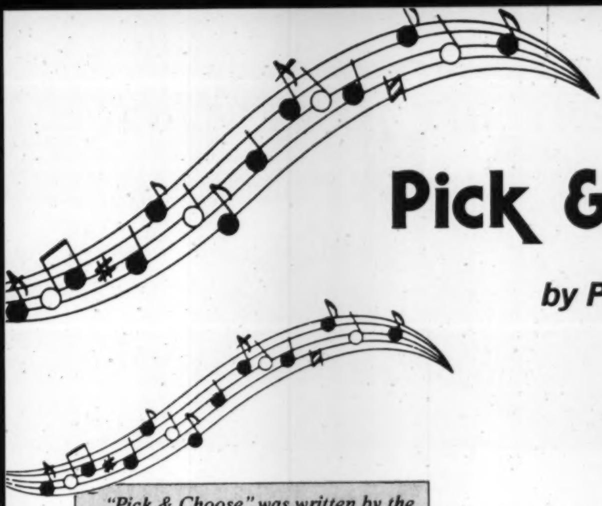
The Music Box

A DAC for the TRS-80, housed in a small box painted to resemble an organ keyboard. The box contains a volume control and an audio amplifier, allowing direct hookup to a speaker. Four voices are available, and the user can define instruments. Notes are entered as letters and numbers. The system costs $149, and is available from Newtech Computer Systems, Inc. 230 Clinton St., Brooklyn, NY 11201.

Music Synthesis System

Micro Technology Unlimited carries a line of software and DACs for 6502 computers such as the PET, AIM, and KIM. The software supports four voices and allows total control of waveforms. Stereo is possible using two DACs, but the additional hardware does not increase the number of voices. Music is entered as hex code. Prices for DACs are around $50 ($89 for an Apple DAC), varying depending on which computer the board is designed for. The software is separate and also costs about $50. MTU is located at 2806 Hillsborough St., P.O. Box 12106, Raleigh, NC 27605. □

> *"People can be divided into three groups: those who make things happen, those who watch things happen, and those who wonder what happened."*
>
> — *John W. Newbern*



Pick & Choose

by Philip Tubb

"Pick & Choose" was written by the designer of the ALF Music Synthesizer Boards, and, as such, cannot pretend to be an unbiased equipment evaluation. It does, however, present a great deal of valuable information on music synthesis, and some important factors to consider when choosing a music system.

Just a year or two ago, there were only a few brands of music cards from which to choose. Today, there are so many that making a choice can be difficult and confusing. After you've made your choice, you can look forward to enjoying music with an ease never before possible—but first, what are the important features and how do you weigh them?

Although I'm going to concentrate on music cards available for the Apple computer, many of the same questions apply to products based exclusively on software (using the Apple's built-in speaker) or products for other computers. I'll consider the ALF cards, the Micro Music card, and the Mountain Computer card for most of the examples because they span a wide range of techniques and features.

There are two main applications for music cards. First, they're fun! Like a dancing bear, a computer that plays music is a joy to behold. It doesn't have to perform some mundane, "practical" task to be entertaining. Whether you add sound effects to games, play avant-garde algorithmic music, or play pre-programmed songs, a music card can add a lot to the enjoyment of your computer system.

Second (and this can be either more fun or very practical), you can enter or "program" your own songs. There are countless reasons for doing this: you can play a song from sheet music without taking instrument lessons for years, you can use the computer for accompaniment if you've already learned how to play an instrument, if you're a composer you can see if the sheet music you've

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The ALF **MC16** *three-channel synthesizer (previously called the "Apple Music Synthesizer"). Note the removable audio cord and disk software (tape software is optional.)*

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ALF PRODUCTS

The ALF **MC1** *nine-channel synthesizer (previously called the "Apple Music]["). This unit also features a removable audio cord and disk software, again tape software is optional.*

Pick & Choose, continued...

written really does match what's in your head (or use the computer to play a complex polyphonic passage that's too difficult or impossible to play on a piano), and on and on.

Then there are many other applications that are rather specialized and apply only to certain interests, like ear training and other music theory/composition training, bio-feedback output generation and general audio-response work, programmable frequency generation for testing and prototyping, summoning alien space craft, and so forth. Knowing exactly what your interests are will help you quite a bit in making a decision, especially if you have a particular need. If you want to dabble in everything and just generally get the most out of your music card, then particular applications won't be an important factor.

The Micro Music **Music Composer** *four-channel synthesizer (previously called the "Micro Composer.") This unit has an attached audio cord, but features direct speaker driving capabilities (note the on-board manual volume control near the audio cable). Shown with disk software, tape software is also available.*

THE HARDWARE

Let's get down to specific factors now. The number one biggie for most people is *price*. There are a couple of ways to look at price. The most obvious one is the "I've only got $1.98, so what's the best I can do?" approach. This is easy because it isn't hard to find out the purchase price of each available model. Generally, be prepared for a price of $100 to $600. Another way is to look at the price/performance ratio, or "How much am I getting for my money?" One of the easiest check is the price/voice (read as "price per voice"), which is computed by taking the total price and dividing it by the number of "voices."

The Mountain Computer (previously "Mountain Hardware") **MusicSystem** *sixteen-channel synthesizer. Note the light pen and the removable audio cable with rear-mounting jacks. The unit has two circuit cards permanently attached to each other (two Apple slots are required). No accessories are currently available.*

Voices vs. Channels

So, the next factor is the number of voices. *"Voice"* is a rather abused term that should be used to refer to a melody that never plays more than one note at a time. For example, if you play a piano using only one finger (and don't cheat by pressing down several keys at once), you're playing a one-voice melody. If you use two fingers to press two different notes either at the same time or just to hold down one note and add another, that's a two-voice melody. Simple.

If you have a song that plays three-note chords in both the main melody and the background melody, you'd need a six-voice music card to be able to play all the notes in the chords. You could probably get along with a five voice card by skipping one of the chord notes without seriously straining the song, but clearly the more voices a card can play the better.

"OK," you ask, "what's so confusing about that?" The problem is that some manufacturers say "voice" when they mean "channel." In fact, you should just assume that people always mean "channel." A *channel* is a piece of circuitry (or software) that can play a one-voice melody and is usually separate from but identical to all the other channels. The reason a five-channel card is not necessarily a five-voice card is that in many instances you will want to use more than one channel for a given voice. Let's say you have a four-voice song, but you want a really "fat" sound on one voice, probably because it's the main melody. The best way to get really interesting sounds on most music cards is to program two (or more) channels to play the same melody, but with the two channels set for different sounds (or maybe with one channel delayed a fraction of a second for an echo or "reverb" effect). So, you'd probably use two channels for the main voice, and one channel each for the other three voices, for a total of five channels.

Virtually any music card can be programmed to use more than one channel per voice. So, you can just take that into consideration when you're thinking about how many channels (which most people will call "voices" or "parts") you need. However, some cards practically require several channels for each voice; so on those you'll want to keep in mind that the effective number of voices may be lower than other cards even if the other cards seem to have a smaller number of voices.

The reason some cards need more channels per voice than others has to do with the way they generate (synthesize) different sounds. No music card presently available for the Apple can du-

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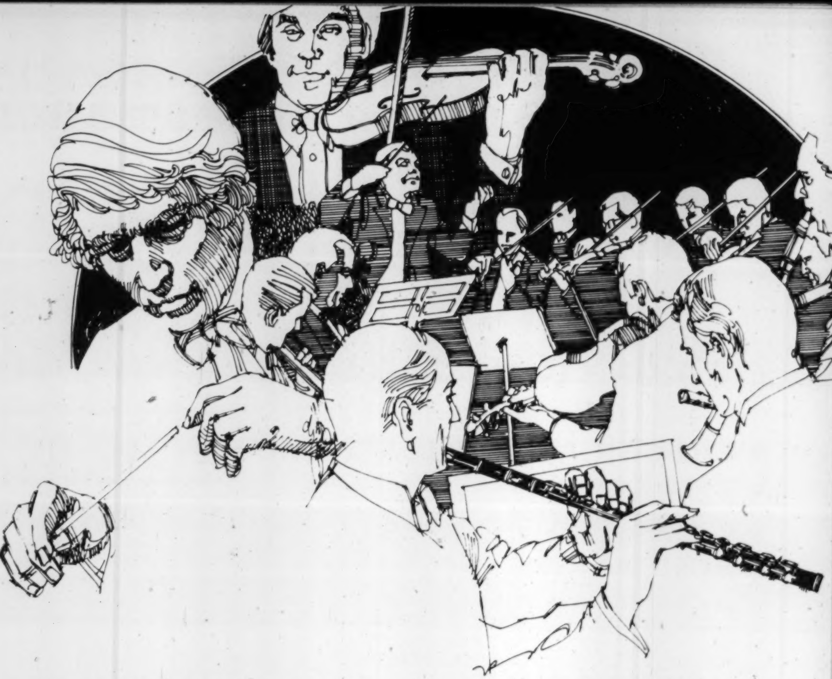
CIRCLE 138 ON READER SERVICE CARD

plicate the sound of conventional instruments. When playing a song you've always heard played by banjos, for example, a music card may sound remarkably like a banjo—especially if a salesman says "Listen to this song; it sounds just exactly like a banjo" before he plays the song. But don't be too quick to agree; if a real banjo player walked in and played along with the music card you'd probably be embarrassed. So forget about "duplicating" conventional instruments. What is really important is being able to create sounds that are pleasant, that fit the mood of the song being played, and that have a lot of variety.



Envelope and Waveform Synthesis

There are many ways to synthesize sounds, and comparing them is like comparing apples to TRS-80s. However, the two main methods rely on envelope synthesis and on waveform synthesis, two fundamental components of musical sounds The "envelope" of a note is its loudness contour. For example, when a violin string is plucked, it starts producing sound very loudly almost instantly, then slowly dies away. But when the same string is bowed, it starts producing sound a little slower (but still quite rapidly) and continues at about the same loudness as long as the bow is moved. When the bow stops, the sound stops almost instantly if the bow is still touching the string.

Sounds used in music have characteristic loudness contours, and people are used to distinguishing different sounds by their loudness patterns. So, a variety of sounds can be produced by using different types of envelopes.

The "waveform" of a note is a technical term used in analog synthesizers which cannot easily be explained since it rarely occurs in conventional sounds; most music card manufacturers probably mean "timbre." The "timbre" of a note is its pattern of overtones and resonances. People are also used to distinguishing different sounds by their resonance patterns. For example, a violin has a distinct shape which causes the sound made by the vibrating strings to resonate in a desirable pattern. Resonance emphasizes certain frequencies of sound.

Overtones are another factor in timbre; they are frequencies which are multiples of the frequency (pitch) being played, usually integer multiples. A note played at 100 Hz (hertz, which is cycles per second) may also be strong in frequencies of 200 Hz, 300 Hz, 400 Hz, and so on. The resonance of an instrument serves to emphasize certain overtones. If the ratio of the loudness of all these overtones stays constant at all times throughout a note, the note will have a characteristic "waveform."

Conventional instruments do not have a fixed waveform, and since people are used to complex overtone patterns (or constantly varying waveforms, if you like) they generally find fixed- or simple-waveform sounds "empty" (as opposed to "fat").

Waveform Control

Although there are many who would disagree with me, I feel waveform control has about the same importance as volume control. Rapidly changing waveforms create a timbre pattern; and rapidly changing volumes create an envelope pattern. Whether timbre or envelope is more important to making a variety of sounds remains the Big Question. Personally, I prefer envelope control because both methods give you a wide variety of sounds (when done equally well), but envelope control is almost always less expensive than timbre control. If you can get both (and I haven't seen a product for the Apple that has sufficient control of both), then great! But if you find yourself choosing one over the other, then a closer look at both is in order.

All notes have some envelope and timbre, the question is whether or not the envelope and timbre are programmable (variable) and to what degree. A common situation is a great deal of timbre control and virtually no envelope control, or vice versa. Let's look at some specific music cards.

First, I'll explain the ALF MC1 and MC16 music cards. The MC1 has nine channels; the MC16 has three channels, but two cards can be used for six channels or three cards for nine. (Since I happen to work ALF, I can assure you that these music cards are the best buy and there's really no reason to look at the others; but in order to maintain a semblance of objectivity I'll describe a few other brands.) Both ALF cards have fixed (non-programmable waveforms. They create a "square" waveform which has the fundamental frequency (the pitch you're playing), plus an overtone three times higher in frequency but at one-third the loudness, plus one five times higher at one-fifth the loudness, and so on all the way up the odd numbers. This creates a moderately fat sound, but since it is unchanging it is not strikingly fat.

Envelope Control

Sounds are created mainly through envelope control. Each quarter note is divided into 240 time slices of equal duration. A pattern of loudness is created by changing the volume at each of these slices. Generally, each note is made up of four pieces; attack (when the note first starts, going from zero loudness to full loudness), decay (when the note slumps down a little), sustain (when the note is held at a fairly high loudness), and release (when the note ends, and drops back down to zero loudness).

The sustain stage can be skipped for "plucked" sounds, and various other changes can be made. In order to make a variety of sounds, the attack, decay, and release must be capable of many different speeds, and the sustain stage must have a

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2	ANNU1	Annuity computation program
3	DATE	Time between dates
4	DAYYEAR	Day of year a particular date falls on
5	LEASEINT	Interest rate on lease
6	BREAKEVN	Breakeven analysis
7	DEPRSL	Straightline depreciation
8	DEPRSY	Sum of the digits depreciation
9	DEPRDB	Declining balance depreciation
10	DEPRDDB	Double declining balance depreciation
11	TAXDEP	Cash flow vs. depreciation tables
12	CHECK2	Prints NEBS checks along with daily register
13	CHECKBK1	Checkbook maintenance program
14	MORTGAGE/A	Mortgage amortization table
15	MULTMON	Computes time needed for money to double, triple, etc.
16	SALVAGE	Determines salvage value of an investment
17	RRVARIN	Rate of return on investment with variable inflows
18	RRCONST	Rate of return on investment with constant inflows
19	EFFECT	Effective interest rate of a loan
20	FVAL	Future value of an investment (compound interest)
21	PVAL	Present value of a future amount
22	LOANPAY	Amount of payment on a loan
23	REGWITH	Equal withdrawals from investment to leave 0 over
24	SIMPDISK	Simple discount analysis
25	DATEVAL	Equivalent & nonequivalent dated values for oblig.
26	ANNUDEF	Present value of deferred annuities
27	MARKUP	% Markup analysis for items
28	SINKFUND	Sinking fund amortization program
29	BONDVAL	Value of a bond
30	DEPLETE	Depletion analysis
31	BLACKSH	Black Scholes options analysis
32	STOCVAL1	Expected return on stock via discounts dividends
33	WARVAL	Value of a warrant
34	BONDVAL2	Value of a bond
35	EPSEST	Estimate of future earnings per share for company
36	BETAALPH	Computes alpha and beta variables for stock
37	SHARPE1	Portfolio selection model-i.e. what stocks to hold
38	OPTWRITE	Option writing computations
39	RTVAL	Value of a right
40	EXPVAL	Expected value analysis
41	BAYES	Bayesian decisions
42	VALPRINF	Value of perfect information
43	VALADINF	Value of additional information
44	UTILITY	Derives utility function
45	SIMPLEX	Linear programming solution by simplex method
46	TRANS	Transportation method for linear programming
47	EOQ	Economic order quantity inventory model
48	QUEUE1	Single server queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model

	NAME	DESCRIPTION
53	FQEOWSH	As above but with shortages permitted
54	FQEOQPB	As above but with quantity price breaks
55	QUEUECB	Cost-benefit waiting line analysis
56	NCFANAL	Net cash-flow analysis for simple investment
57	PROFIND	Profitability index of a project
58	CAP1	Cap. Asset Pr. Model analysis of project
59	WACC	Weighted average cost of capital
60	COMPBAL	True rate on loan with compensating bal. required
61	DISCBAL	True rate on discounted loan
62	MERGANAL	Merger analysis computations
63	FINRAT	Financial ratios for a firm
64	NPV	Net present value of project
65	PRINDLAS	Laspeyres price index
66	PRINDPA	Paasche price index
67	SEASIND	Constructs seasonal quantity indices for company
68	TIMETR	Time series analysis linear trend
69	TIMEMOV	Time series analysis moving average trend
70	FUPRINF	Future price estimation with inflation
71	MAILPAC	Mailing list system
72	LETWRT	Letter writing system-links with MAILPAC
73	SORT3	Sorts list of names
74	LABEL1	Shipping label maker
75	LABEL2	Name label maker
76	BUSBUD	DOME business bookkeeping system
77	TIMECLCK	Computes weeks total hours from timeclock info.
78	ACCTPAY	In memory accounts payable system-storage permitted
79	INVOICE	Generate invoice on screen and print on printer
80	INVENT2	In memory inventory control system
81	TELDIR	Computerized telephone directory
82	TIMUSAN	Time use analysis
83	ASSIGN	Use of assignment algorithm for optimal job assign.
84	ACCTREC	In memory accounts receivable system-storage ok
85	TERMSPAY	Compares 3 methods of repayment of loans
86	PAYNET	Computes gross pay required for given net
87	SELLPR	Computes selling price for given after tax amount
88	ARBCOMP	Arbitrage computations
89	DEPRSF	Sinking fund depreciation
90	UPSZONE	Finds UPS zones from zip code
91	ENVELOPE	Types envelope including return address
92	AUTOEXP	Automobile expense analysis
93	INSFILE	Insurance policy file
94	PAYROLL2	In memory payroll system
95	DILANAL	Dilution analysis
96	LOANAFFD	Loan amount a borrower can afford
97	RENTPRCH	Purchase price for rental property
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large number of different levels. Also, the volume control circuit must have a large number of settings available so the loudness changes will be smooth. The more expensive MC16 has 256 volume levels over a 78 dB range, which gives it steps which are usually too small to hear; this makes for smooth fade-outs and a wide variety of sounds. The modestly priced MC1 has 16 volume levels over a 28 dB range; so the fade-outs aren't so smooth and the variety of sounds isn't as wide.

Both cards do a reasonable job of making a variety of sounds, mostly thanks to the rapid and detailed volume control used to make the envelope patterns. Some control of timbre can also be achieved by using more than one channel per voice. For example, if you want to put in a second overtone (with a frequency twice that of the fundamental), you would play the melody on another channel but transposed up one octave. Since a one octave transposition gives a frequency twice as high, the fundamental of the second channel would be the second overtone for the first chnanel. It would also supply a sixth (2 x3) overtone, a tenth (2 x 5), a fourteenth (2 x 7) overtone, and so on since it has all odd overtones. Using this technique makes a sound which has true timbre (as opposed to an unchanging waveform) since different envelope patterns can be used on each channel, making the ratio of the fundamental and the second overtone (for example) variable depending on the ratio of the envelope loudnesses at any given moment.

Fortunately, the software makes it easy to play the same melody on two channels at once, even with different transpose values and envelopes, without having to enter identical melodies into each part separately. So, the ALF cards have a great deal of envelope control, and a modest amount of timbre control.

Now let's take a look at the Micro Music card. It has four channels. With it, you can program the ratios of the various overtones to create a complex waveform. In order to have a wide variety of sounds, it is important to be able to select many overtones and to have a large number of volume settings available for each overtone. To have control over timbre, it is necessary to change the volumes of the overtones during each note.

Although I have an old version of the Micro Music card that allows only fixed overtone volumes, the new version apparently allows the volumes to change. Specifying the relative volumes of each desired overtone defines a particular waveform. In the new version, several waveforms can be defined which are played one at a time in sequence for each note. This allows the volumes of the overtones to change during a note, creating a fatter and more unique sound than a single waveform.

An important factor is the rate at which the different waveforms can be cycled through; the more waveforms per second you can use the smoother your timbre will be and the more varied it can be. Another factor is whether the sequence of waveforms repeats, holds at the last waveform, repeats a small loop of waveforms at the end, or whatever. By defining the combined volumes of all overtones to follow the desired envelope pattern, Micro Music also uses this sequenced-waveform scheme to generate the envelope pattern. Unfortunately, the Micro Music card has very little hardware, placing all the computational burden on the software which is hard pressed to keep up. The waveforms sequence through far too slowly to create detailed envelopes. So, the Micro Music card has a great deal of timbre control, and modest envelope control.

Finally, let's look at the Mountain Computer card. It has 16 channels. Like the Micro Music card, it can create a complex waveform by setting volume ratios on overtones. However, it doesn't seem to have any provisions for sequencing through several waveforms to give versatile timbre control. Like the ALF card, the same melody can be played on several channels to expand the timbre control. The software has provisions for this. Although I don't know the details of their envelope generation, the card provides very few different envelopes. So, it would appear that the Mountain Computer card has the envelope capabilities of the Micro Music card and the timbre control of the ALF card, plus generation of different waveforms (but only one at a time per channel). However, the Mountain Computer card has one drawback. On the ALF and Micro Music cards (or more precisely, in their software), the user can define the envelope or timbre he wishes to use. Not so on the Mountain Computer card, where only six pre-programmed sounds are available.

So, if creating a wide variety of sounds is important, then you can concentrate on the ALF cards, the Micro Music card, and all the similar cards.

Another important feature in creating a variety of sounds is the number of sounds you can create in each song. On the Mountain Computer card, each channel is assigned one of the six available sounds, and the waveform on a given channel cannot be changed from measure to measure. On the older Micro Music card, the same scheme was used. The newer one may allow changes, but in any case the amount of memory used by a timbre definition is very large and only a small number of definitions can be in memory for any given song.

The ALF card, on the other hand, allows the envelope to be changed separately for each voice and at any time during playback. Each envelope definition uses only a small amount of memory, and in any case specific elements of the definition can be changed individually so the whole definition need not be stored. So let's say the melody of a song starts off funky, changes to mellow, and then goes back to funky.

On the Mountain Computer card, you would have to program the funky part on one voice, and the mellow part on another; at any given moment only one of two voices would be playing but both would be "used up." On the ALF card, you would define a funky envelope, program the funky part, then change the envelope to mellow, program the mellow part, go back to funky, and finish up; all using only one voice. On any system where the sound can be changed from note to note you can get much, much more variety of sound in each individual song.

I just touched on an important point: Mountain Computer's and Micro Music's waveform/timbre definitions require a large amount of memory for each sound being defined, whereas ALF's envelope definitions require a smaller amount of memory. While there's an obvious advantage to using less memory, you should also remember that someone has to define what's in the memory. The process of defining a single overtone-based waveform requires that the user specify more information than when defining a single envelope. And since Micro Music uses several waveforms in sequence, there's a lot of work in defining a single timbre! Mountain Computer bypasses this problem by not allowing the user to define a new sound.

On both the Micro Music card and the ALF card, you'll have to understand something about how the various specifications affect the sound before you'll be very good at making up your own sounds —that will take some practice. Generally, the more information you have to specify

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CIRCLE 139 ON READER SERVICE CARD

to create a sound, the longer it will take you to learn how to do it. If you're planning on using sounds that others have specified, that's easier on the Mountain Computer and Micro Music cards (since each sound can be read from disk and stuck to a particular channel) than on the ALF card (where you'd have to step through a pre-programmed song to find the envelope specifications used).

Listen

You'd get tired of songs that all sound the same, and that's why I've been stressing "variety of sound." Ideally, music cards would be so good at making any sound that you couldn't tell which card produced a given song. In actuality, an experienced listener can tell which music card (or at least which method of synthesis) has produced a given song. So, all the songs will have certain similarities.

But how "wide" is a wide variety of sounds? That's difficult to answer. Since ALF sells two models of music cards, I'm often asked what the differences are. When I mention that one has 256 volume levels and the other 16, people say "So what?" Then if I say that one sounds smoother than the other, they say "Well, how much smoother?" (in a confused tone). One can hardly say "26.3 points smoother on the Hoffmeyer scale" or some similar flippant remark. I recommend that people *listen* to the two products. That's your biggest tip in choosing a music card. If at all possible, find a dealer who will play both cards (or all cards) you're considering. Keep in mind that a dealer is not likely to have a very good stereo system available. (And most dealers prefer to carry only one brand of music card, which makes comparisons difficult.)

You probably won't be able to get a demonstration record or tape from the music card manufacturer. We've made several, and are always disappointed—tape recorders and records just can't capture the sound of digital music cards well.

There are three things to listen/watch for. First, is the sound clean—free of "pops," steppiness, hissy noise, and so forth? Second, how much variation is there from song to song—can you hear different "instruments" in any given song and from song to song? (Some types of noise can be eliminated by using excessive filtering which eliminates certain frequency ranges. If all songs sound very damped or mellow, it may be that the higher frequencies have been cut off. If no songs play low, bassy notes, it may be that the card can't play low notes. Neither of these conditions will be indicated by a single song, since you can't expect each song to cover the full range of the card's capabilities.) Third, who programmed the songs you're hearing? If they're all done by the experts at the factory, will you be able to program your own? Obviously, new products will not have many songs programmed by customers; but any product that's been out for a few months should have some decent songs programmed by people other than the company that made it.

To summarize the complicated idea of price/voice described above, I'd like to give my own personal opinion about the cards just described. Usually, only one channel is needed per voice on the Micro Music card; rarely two or more channels will be used. So count the Micro Music card as a four-voice card. With a price of $205, that's $51.25 per voice. Four of the six sounds available on the Mountain Computer card require three channels per voice; one takes two channels per voice and the other only one. Songs on the Mountain Computer card usually take two channels per voice, often three, and rarely only one. So count the Mountain Computer card as an eight- to five-voice card. With a price of $545, that's $68.12 to $109.00 per voice. Both ALF cards usually use only one channel per voice, but often use two channels on one or two of the voices. So count the MC1 as a seven- to nine-voice card. When you're using just one MC16 card you tend to use just one channel per voice, so count the MC16 as a three-voice card, but count three MC16s used together as a seven- to nine-voice card like the MC1. With a price of $195, the MC1 is $21.67 to $27.86 per voice. The MC16, with a price of $245, is $81.67 per voice but up to $105.00 per voice when using three cards.

Range

The remaining hardware considerations are less important that the ones just discussed. The first is the pitch *range*. A piano has 88 notes called halftones (there are 12 halftones in an octave), starting with an "A" three octaves below middle "C" and ending with a "C" four octaves above middle "C." This is roughly 27.5 Hz to 4,186 Hz; which may surprise you since "everyone knows" that human hearing (and good stereo equipment) goes up to about 20,000 Hz. Well, if you consider that the overtones of 4,186 Hz are 8,372, 12,558, 16,744, 20,930 Hz, and so on you'll see that you can get up to 20,000 pretty quickly with just a few overtones. (However, Mountain Computer filters out frequencies above about 13,000 Hz and Micro Music filters out frequencies above 3,500 Hz. This will make the audible frequency range above the filter frequency to 20,000 Hz empty, creating "damped" sounds.)

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CIRCLE 306 ON READER SERVICE CARD

Pick & Choose, continued...

The pitch range should be specified in octaves or halfsteps. The Micro Music card has a range of four octaves. On the ALF cards and the Mountain Computer card, it is a little more complicated, but ALF's MC1 has a stated range of 72 halfsteps (with 12 halfsteps per octave, that's six octaves), the MC16 a stated range of 96 halfsteps (eight octaves), and Mountain Computer a range of eight octaves.

Tuning Inaccuracy

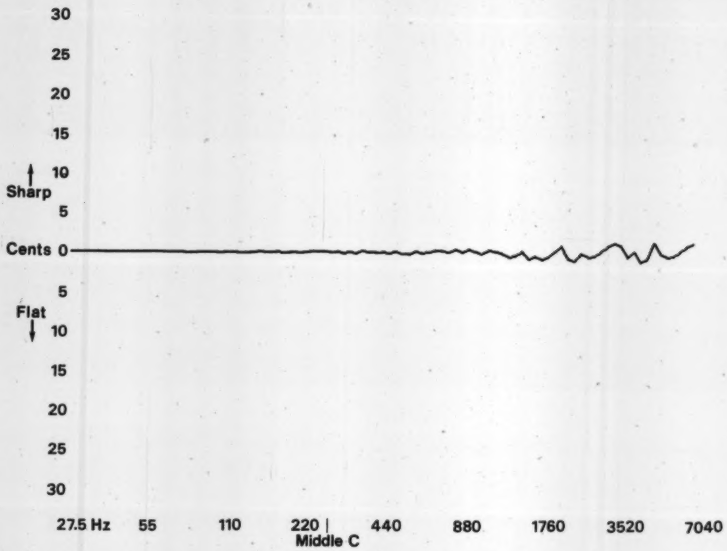
The reason the pitch range is complicated has to do with *tuning inaccuracy*. ALF's MC1 really has a pitch range from 62.5 Hz (about the "C" two octaves below middle "C") to 63,920 Hz (about two octaves above human hearing); the MC16 from 27.2 Hz (just below the lowest piano note) to 891,000 Hz (over five octaves above human hearing); the Mountain Computer card about 0.5 Hz (click, click, click) to 13,000 Hz (near the limit of human hearing).

So why don't these cards claim large pitch ranges? Because only certain frequencies can be produced, and sometimes they aren't very close to the frequencies you want to produce. For example, the ALF MC1 can produce 1,024 different frequencies: about 63,920 Hz divided by any integer from 1 to 1,024. So if you want to produce an "A" at 440 Hz, you can either use 63,920/145 which is 440.83 Hz or 63,920/146 which is 437.81 Hz. — obviously you'd use the 145 divisor. But either way you'll be slightly off the desired pitch.

Musicians measure this difference in units they call "cents." A cent is one-hundredth of a halfstep. In other words, if you were trying to produce an "A" but were exactly 100 cents sharp, you'd be right on for producing an "A" sharp.

To calculate the tuning accuracy, you divide the frequency you're actually producing by the frequency you want to produce, take the log of the result, divide that by the log of 2, and multiply everything by 1200. Use any base log you like. For the previous example. (LOG(440.83 /440) LOG(2))*1200 is 3.25. A positive result means the pitch is sharp, a negative results means that the pitch is flat.

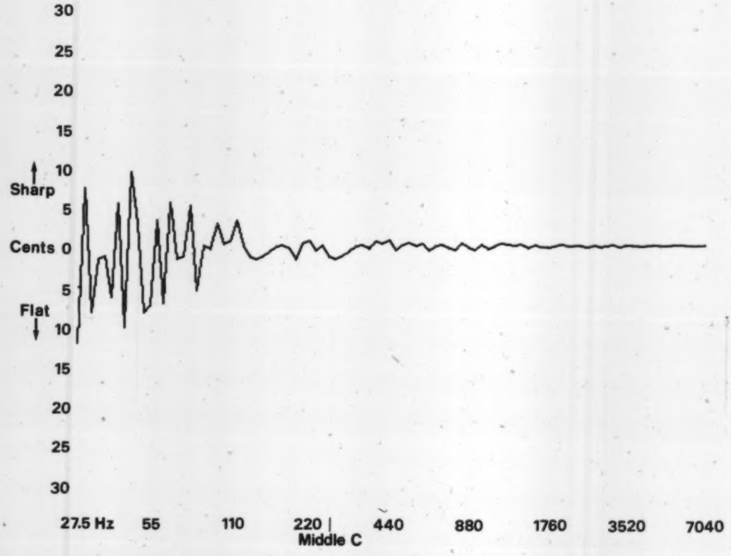
The stated top pitch of the MC1 is a "C" of about 4,186 Hz. But why not do the next higher "C" at 8,372 Hz? Well, you could either use 63,920/8 which is 7,990 Hz and flat by 80.86 cents (!), or you could use 63,920/7 which is 9,131.43 Hz and sharp by 150.32 cents (!!). Obviously, the 150 cent error is totally unusable, since it is even higher than "C" sharp. The 80 cent error is also no good, since the frequency would be closer to "B" than "C." In fact, an error of just 50 cents would mean the frequency is half



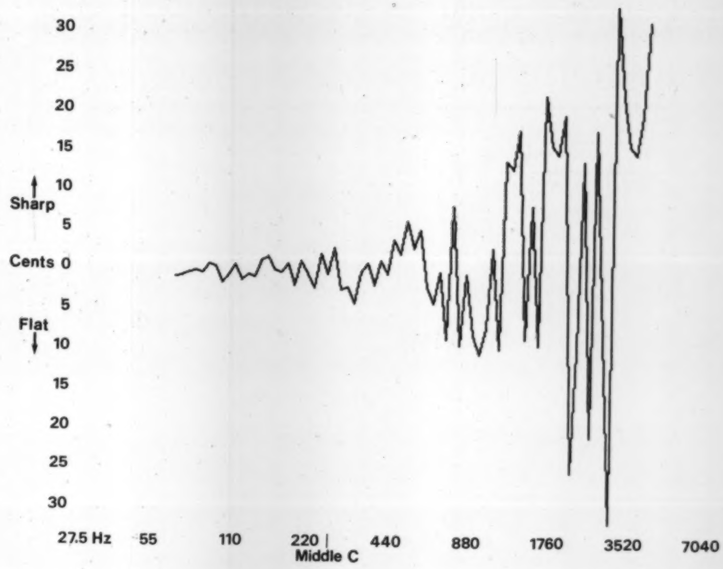
Graph 1. ALF MC16

These graphs show how accurately an equal tempered scale can be produced. A flat line would indicate perfect tuning; a flat line at 0 cents would mean perfect tuning at the standard A-440 tuning. The indicated frequencies (27.5 Hz, 55 Hz, and so on) are A's, each one octave apart. The twelve data points per octave have been connected by plotted lines to improve visualization.

Graph 1 shows the tuning accuracy possible with ALF's MC16 (which uses a 16-bit

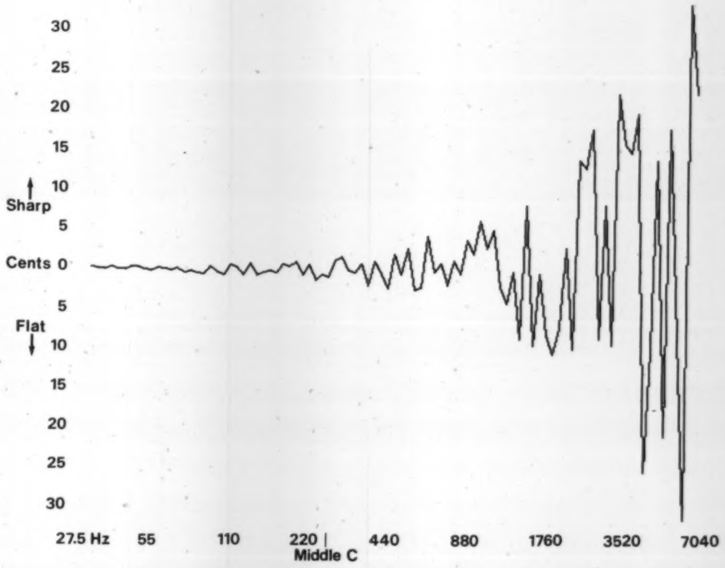


Graph 2. Mountain Computer



Graph 3. ALF MC1

divider circuit). Graph 2 shows the accuracy possible with Mountain Computer's card (which uses a 16-bit counter circuit). Graph 3 shows the possible accuracy of ALF's MC1 or any card using the Texas Instruments SN76 chips at the same clock frequency (the chip has a 10-bit divided circuit). Graph 4 shows a hypothetical card using a General Instrument AY-3 chip (which has a 12-bit divider), note especially the increased pitch range over the SN76 chip of graph 3.



Graph 4. General Instrument AY-3

way between the note you want and the next note, so the listener would have to guess which note it is.

In practice, the tuning inaccuracy must be far less than 50 cents or the song will sound horribly out of tune. Well then, is the inaccuracy of 3.25 cents mentioned in the A-440 example going to sound bad? It's hard to say. Experts generally agree that an error of 2 cents or less can be counted as "perfect"—people can rarely even tell which pitch is higher than the other when a pitch and a pitch sharp or flat by 2 cents are played one after the other. Probably anything less than 5 cents can also be considered excellent. Errors of 10 cents become rather obvious at times.

The tuning accuracy of the Micro Music card is hard to determine due to the method used to generate tones. Aside from an original version where everything was quite sharp ("intentionally"), the tuning doesn't seem bad but does have a lot of frequency "jitter." The tuning of the ALF cards and the Mountain Computer card is easy to determine since they both use a frequency division approach. Its easy to see that near the bottom of the piano scale, where the frequencies are 27.5 Hz, 29.14, 30.87, 32.70 Hz, and so on, a great deal of accuracy (in terms of Hz) is required, whereas near the top, where the frequencies are 4,186 Hz, 3,951, 3,729, 3,520 Hz, and so on, little accuracy is required.

The ALF cards have a lot of frequency resolution at the low end of the scale (the MC16 can produce frequencies of 27.1912, 27.1916, 27.1920, 27.1924 HZ and so on) and little at the top end (where the MC16 goes 891,000, 594,000, 445,500, 356,400 Hz and so on), so they fit the piano scale nicely. The worst cast tuning inaccuracy in their lowest octave is 0.3 cents for the MC16 and 1.75 cents for the MC1. Both go more out of tune as the pitches get higher; the worst case in their highest octave is 1.5 cents for the MC16 and 33 cents for the MC1. These figures include a plus-or-minus 0.015% inaccuracy for the crystal which provides the original frequency reference.

Fortunately, the most "out of tune" frequencies of the ALF cards are above the piano scale range. Unfortunately for Mountain Computer, who uses a slightly different technique, their most "out of tune" frequencies are at the bottom of the piano scale. For example, the lowest piano scale note has a frequency of 27.5 Hz, which you'd think you could get "right on" since Mountain Computer claims to produce any frequency in 0.5 Hz steps, but really you get a choice of 27.31 Hz or 27.80 Hz: 12.06 cents flat or 18.58 cents sharp! It does get progressively better (see the graphs).

If you're using the music card as a frequency generator, you'll want to in-

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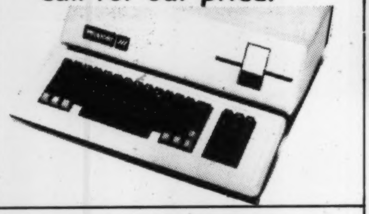

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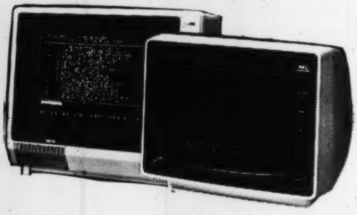

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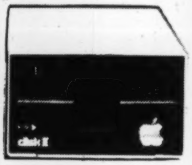

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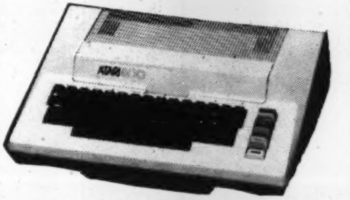

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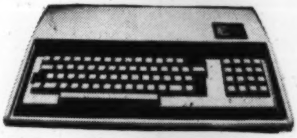

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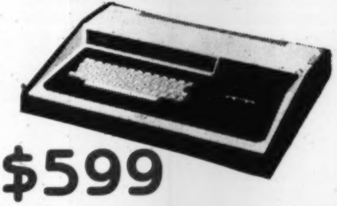

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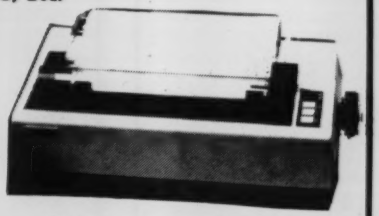

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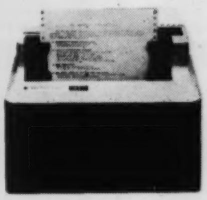

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vestigate the frequencies available in detail. If you're playing music, you'll mostly want to consider the usable range and whether or not the tuning accuracy is reasonable. Remember that it may be harder to hear tuning inaccuracy at the ends of the scales than in the middle, where your hearing is good and most notes are played. However, if you're into ear-training or teaching perfect-pitch, you'll want really good tuning accuracy.

Stereo

Another hardware feature is *stereo* outputs. Having stereo (instead of mono) outputs does add a little to the music. No music card I've seen has elaborate stereo provisions (such as "pan" or pseudo-ambience), they just provide two audio outputs instead of one, with some method for putting certain channels on certain outputs. The ALF MC16 has only one output, and is therefore mono. However, when you use two MC16's (to get six channels), there are two outputs, so three channels are on the "left" and three on the "right." If you use three MC16's (to get nine channels), it adds three more channels which are on both the left and right outputs, to create a "middle" effect. The MC1 has the same stereo configuration you would get with three MC16's. The software for both ALF cards provides a command to select which stereo position each channel will be on, but the stereo position of a channel cannot be changed from note to note.

The Micro Music card I have does not allow stereo, although Micro Music says their new software allows stereo if you use two cards (although you would not get eight channels by using two four-channel cards). The Mountain Computer card has eight channels on the left output and eight channels on the right, and positioning is set by command (like the ALF cards, position cannot change from note to note). However, let's say you're using one of the three channel per voice sounds. Two of these on the left and two more on the right would use six out of the eight channels for each output. Then, you wouldn't be able to get the fifth voice because neither output would have three channels left. Apparently there's some way to set the card to mono if you want to get that fifth voice. Very interesting effects can be made on any card by playing the same thing on two channels, one on the left and one on the right, and delaying one channel by a very small amount. This is easier to do with some software than others; see the software descriptions.

The ALF MC16, the Micro Music card, and the Mountain Computer card represent special designs; but many

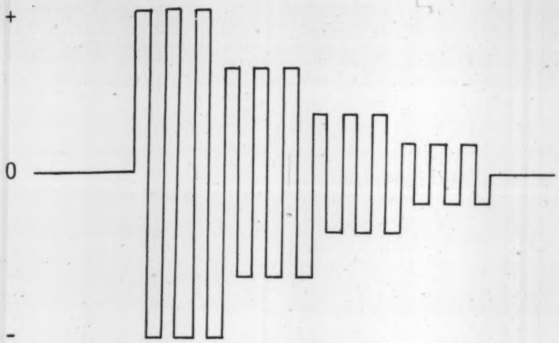

Figure 1a.

Figure 1b.

Figures 1 and 2 show a greatly simplified view of the output signals of the two popular 3-voice chips.

Figure 1a shows the Texas Instruments SN76 output, generating a square wave frequency that varies between a positive (+) and negative (-) level. Figure 1b shows the average voltage or D.C. offset. Figure 2a shows the General Instrument AY-3 output, generating a square wave frequency that varies between a positive (+) level and ground (0). Figure 2b shows the average voltage or D.C. offset, which is always about half the amplitude of the square wave output. Each time the D.C. offset changes, a "click" or "pop" is heard; the larger the change, the louder the pop.

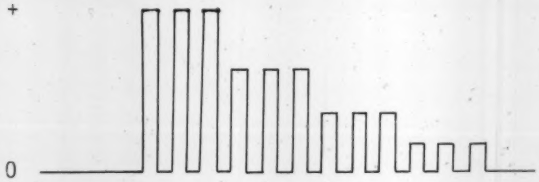

Figure 2a.

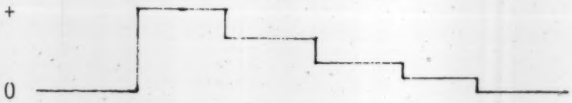

Figure 2b.

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music cards just rely on one of the three-channel synthesizer chips: the G.I. (General Instrument) AY-3-8910 (or the functionally identical AY-3-8912) or the TI (Texas Instruments) SN/76489N (or its friends, the SN76489AN and SN76494N).

There are two major differences in these two manufacturers' chips, but otherwise cards using these chips can be considered virtually identical from a strictly hardware capability viewpoint—about the only thing you can change is the master clock frequency, which slides the tuning inaccuracy around and changes the usable pitch range.

Note that from a total hardware viewpoint, there can be many significant differences. Is the design correct?—will it work under all conditions, and not draw too much power or otherwise affect my Apple? Does it have a removable audio cable, on-board audio amplifier capability, or other features? On our ALF MC1, we spend a little extra and put latches on the board to protect the expensive chips from static and eliminate the need for "holding" the processor—some cards "hold" the processor during programming which gives the software less time to generate detailed envelopes or perform other tasks.

One difference is that the SN76 chips have a ten-bit frequency divider, whereas the AY-3 chips have a twelve-bit frequency divider; this gives the AY-3 chip boards better tuning accuracy (see the graphs). This sounds like a good reason to pick the AY-3 chip, but due to the other difference we at ALF picked the SN76489N for our MC1. The SN76 chips have a symmetric output where the square wave alternates between a "plus" and a "minus" level, so the average output voltage (or D.C. offset) is always zero. The AY-3 chips do not: their outputs alternate between a "plus" level and zero, so the average output voltage (or D.C. offset) is half the volume level; this creates unwanted clicks or "pops" at each volume change—very poor design. Who cares if your tuning is a bit more accurate if the sound quality is poor?

THE SOFTWARE

Software features can't be compared quite as "scientifically" as hardware features; and yet it is probably the software features that most determine whether or not a particular product will be good for you. Most companies seem to feel that hardware is easy to design—build it, and if it works you're done. Obviously, there's more to it than that—you want hardware that works all the time and in every Apple, that doesn't damage the Apple, that is reliable and as insensitive to static electricity as possible, that is low cost without being cheap, that is well "balanced" (isn't missing important features and doesn't have wasted "just looks good in the specs" features), and so on. But there is a certain amount of truth to the idea that hardware can be designed rather easily, especially compared to software.

Software should be written to take the best advantage of the hardware. But everything has its good points and bad points—do the amazing advantages of feature #29 justify cutting down the maximum song length by 2K? And once you've picked which features should be implemented and in what manner, does the software work? How do you tell?

I've seen plenty of music cards for the Apple, and I've always been able to find at least one error in the software. I don't know of any errors in the ALF Entry program, and no customer has every reported finding one, but does that mean there aren't any? I mentioned that I have an "old" version of the Micro- Music card, but actually I think I have the most recent hardware, and Micro Music has come out with new software.

Mountain Computer was nice enough to send their customers new software when they came out with a revision. Several other companies have also come out with new software for their cards; no doubt it's confusing to their customers. I've never liked people who keep coming out with "new" software, usually they're fixing errors they made in the original version rather than adding or refining features. Why didn't they find the errors before they released the original version? Probably they wanted to keep ahead of their competitors—the people who are actually testing their software before they send it out.

One thing I dislike even more than "new" software is all that incredible software that's "going to be available." Here's a great tip for you: if you can't get it now, don't count on ever getting it. That's what I've been doing in this article, because I've seen too many promises. Software that's "going to be available" does everything, does it on a 4K system without a disk, and does it faster than an Apple III.

As advertised, Mountain Computer's music card has "16 voices" with "waveforms, envelopes, and amplitudes which are fully programmable for each voice," and will "print out sheet music with a graphics printer," plus a variety of other questionable statements. In fact, as purchased the card does have 16 "voices" to some degree, but they do not each have programmable waveforms and envelopes (as already mentioned, they're not programmable by the user); and there's no provision at all for printing sheet music on a graphics printer.

Most companies don't make claims that are simply false, usually they're just "stretched" a lot (probably because false claims aren't just unethical, they're illegal). I talked to Mountain Computer's

ALF Music Synthesizer

The ALF Apple Music Synthesizer (AMS) is an easy to use peripheral which allows you to program music into an Apple II computer using standard musical notation. The ALF kit includes the synthesizer board (plugs into any peripheral slot), exceptional quality software, and an extensive user manual.

Sophisticated Music Entry Program

Sheet music is easily entered using the Apple game paddles. The high-resolution ENTRY program features the familiar music staff with a "menu" of musical items listed beneath it (note lengths, rests, edit commands, accidentals, etc.). One game paddle moves a cursor up and down the music staff and is used to select the note pitch; the second paddle chooses from the menu items (note length, etc.) With the ALF hi-res ENTRY program, you won't have to use cryptic codes to select note parameters.

As you program sheet music with ENTRY, measure bars are inserted automatically (and note values are tied over the bar where necessary). Key signatures are also automatic—you don't have to keep writing in every sharp or flat!

Three monophonic, individual parts can be programmed with each ALF Music Synthesizer. Two boards are required for stereo. A total of three synthesizers can be used simultaneously for a maximum of nine voices. By controling the envelope (or shape) of each voice, many different instrumental sounds can be simulated.

Eight-octave Range

The ALF Music Synthesizer has a pitch range of eight octaves—a wider range than a grand piano. The ALF can also play semitones—"blues notes" or the pitches in between the keyboard notes of a piano. (The pitch range is from 27.5 to 55,000 Hertz, well beyond the limits of human hearing.) Tuning accurancy is virtually perfect within two cents of pitch value.

Every parameter of the ENTRY program can be changed again and again during a musical piece. For example, you can make changes in key, time signature, volume, and timbre (envelope). Parts can be edited at any time, also. Notes can be added or deleted, note length can be changed, as well as pitch, volume, etc.

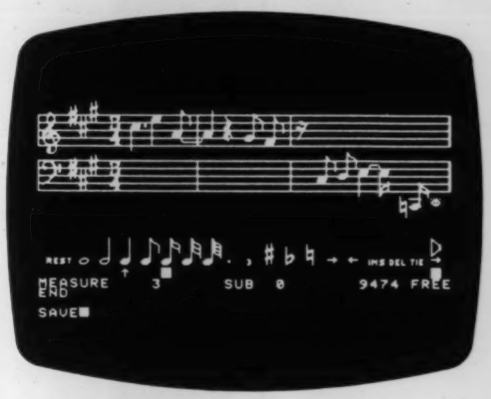
You can save songs on either cassette or disk, and play them back using either ENTRY or PLAY. The playback speed is adjusted with one of the game paddles, and can be varied during the playback, if you wish to change the overall tempo.

Colorful Playback Display

The ALF Music Synthesizer features a 16-color low-res graphic display during song playback. Each musical part is represented on a stylized piano "keyboard"—the intensity of the note determines the color, and the pitch is shown in relation to "middle C".

The ALF Music Synthesizer requires the use of an external audio amplifier. Stereo programming is possible with the use of two or three synthesizer boards.

The ALF software includes the ENTRY and PLAY programs, sample songs, an introduction to "envelope shaping", and demonstrations of advanced uses of the synthesizer.



With the ALF software, entry of music is easy, fast and accurate.

Nine Voices for only $198

The new ALF "AM-II" music synthesizer offers an unbeatable value for the Apple owner who is a music hobbyist. With nine voices on a single music board for $198.00, the AM-II is the most economical device for creating music with the Apple.

The AM-II uses the same excellent ENTRY and PLAY programs as the more sophisticated ALF Music Synthesizer (AMS); the same hi-res graphic display from which notes are selected with the Apple game paddles (not typed with cryptic codes). All of the conveniences of the ENTRY program apply—easy editing, playback with low-res display, ability to save songs on cassette or disk, etc.

The AM-II has **stereo output** (3 voices in left, 3 voices in the middle, 3 voices in the right).

How can the AM-II offer so much for only $198.00? The two basic differences between the AM-II and the ALF Apple Music Synthesizer (AMS) are pitch accuracy and dynamic range. The AM-II has an accurate pitch range of about six octaves. Pitch values above the treble staff become increasingly inaccurate. Also, the AM-II has a dynamic range of 28db, with 16 different volume levels, (the AMS has a dynamic range of 78db).

The AM-II is manufactured with the same high quality standards as other products from the ALF Corporation. No sacrifice has been made in reliability; the new AM-II is simply a great bargain.

Professional musicians will still want to use the original Apple Music Synthesizer (AMS) for its extended range and volume controls (the AMS has a range of 8 octaves). But for the Apple owner who is interested in music as a hobby, the AM-II is the best music peripheral value available today.

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representative at a local store, and he assured me that we would receive software that allows sounds to be defined by the user "in October (1980)." A new software package and manual did indeed arrive in October ("Version 1.2"), but it only corrected a few errors; there were no new capabilities evident. I'll be really surprised if Mountain Computer ever comes out with software that prints sheet music where the printout really looks something like the sheet music (with proper beaming, flag direction, note and rest placement, slurs and other expression marks, and so on). So take my tip and buy based on what you actually get. I hate to say that you shouldn't trust advertising, since so many companies are very honest, but with the advertising I've seen there's no choice—look before you leap, let the buyer beware, and don't count your chickens before they hatch.

Ease of Use

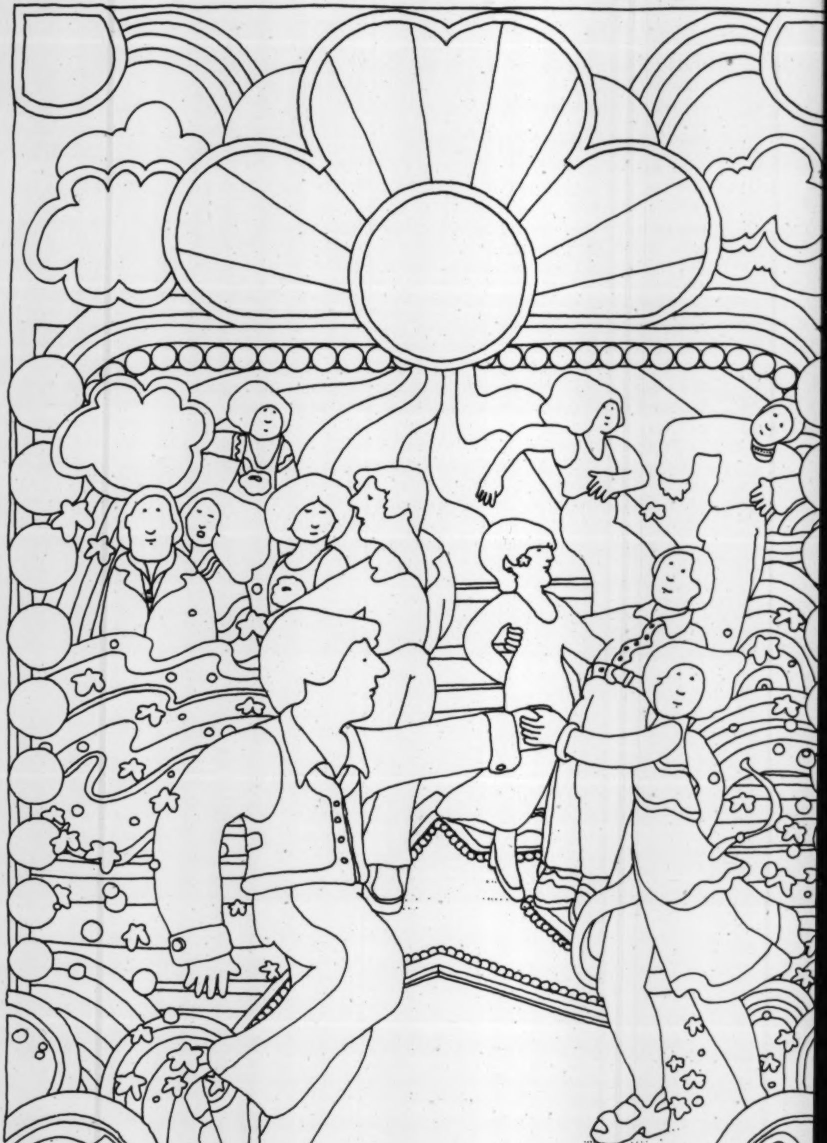
Probably the most important aspect of software is *ease of use*. To illustrate, when I boot my "Super Sound Generator Disk Version 1.0" from Symtec and press any key to get to the main program, I can then press control D to access the disk commands, then press L to load a song, type the song number and press return. Everything's fine so far, the song loads and appears on the screen. Now if I just press B (for "backspace"), funny things start appearing on the screen; then one by one the disk drives on my Apple turn on and erase whatever disk happens to be in them (unless they're write-protected). Since this sort of operation puts the user in a very "cautious" mood, fearful that the next keystroke will erase his song, he probably won't be feeling very creative. Any sort of annoyance tends to interfere with creativity; the smaller annoyances can probably be tolerated, but the bigger ones destroy the whole mood of music entry.

So a big factor is *song erasure*. You want a system that doesn't erase or "lose" your song unless you really want it lost. All music systems have some commands that will erase your song, and mostly these commands are explained in the manual. But clearly Symtec didn't intend to have the backspace command erase my song! Generally, you can expect "sloppy" programs—ones that don't have a lot of user-input checking, that plot funny things on the screen when you ask for something strange, that are missing vital features, and so on—to accidentally lose your song in more ways than well-thought-out programs.

In fact, any error that causes the program to die, winding up in Basic or the monitor, will leave you wondering how to save (or recover to some degree) the song you were working on at the time. Unfortunately, there's practically no way to tell whether the software you plan to buy is well written or not; and most people are reluctant to demand a refund when they do purchase software with "bugs" or errors. Remember that if the system you buy doesn't perform up to advertised specifications or has blatant errors, you have a legal right to a full refund—it's the only way things will start improving.

You might be wondering what kind of commands erase your song on purpose. Well, the most obvious one is NEW, a popular command for erasing the current song so you can start over. Another one is LOAD (or READ, or control-D L, or whatever), the current song must be erased so the desired song can be loaded from disk (or tape in some cases).

One of the most interesting ways to erase your song I've seen is on the Mountain Computer system. In order to play your song (a rather common operation),



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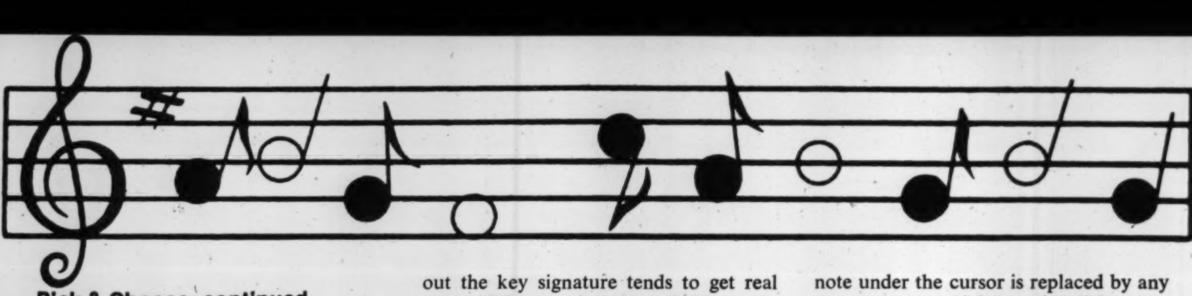


Pick & Choose, continued...

you must type QUIT to leave the editor, then a menu appears where you can select the playback program. Unless you SAVE your song before you try to play it, it's gone. When you type QUIT the program shows VERIFY on the screen, but since the system is constantly showing VERIFY (and doing so whether or not your song is really about to be erased), you soon get used to immediately typing Y to go on past the "verify."

Sometimes commands don't erase your song, they just mangle it beyond repair. An example is ALF's SPEED command, which can be used to do interesting things like make all the notes in your song the same length—good luck fixing that up! These commands make wondrous large-scale changes in your song, but they usually have a nasty tendency to do whatever you asked them to do, even if you've asked for something hopelessly stupid. The ALF manual recommends that you save your song before using the SPEED command, and this is good advice for all commands that have large-scale change possibilities (not just in music systems—you'd be wise to save a program before trying Applesoft or Integer Basic renumber).

Blunder Repair

That brings up the next important feature to look for: *getting out of blunders.* Once you've made a mistake, how easily can you get back to where you were before you made it? On nearly all systems, once you do a NEW or a LOAD your old song is past recovery. People with any experience at all don't seem to have any problem with inadvertent NEW's (and people who do have trouble will get lots of experience rather quickly). The more common mistakes are skipping a note, putting in an extra note, putting in the wrong key signature or forgetting to put it in, and so on.

Usually, little things like skipping a note are rather simple to fix up. Leaving out the key signature tends to get real messy. When I went through Mountain Computer's example in their preliminary manual, it told me to put in the wrong key signature; being mostly absorbed in learning about their system I failed to notice that the key signature on the screen didn't match the key signature in the music they'd given. So, I merrily put in one voice, then saved the song and went off to the playback program. The mistake became rather obvious at that point. Then I went back to the editing program to correct the key signature, swearing at the manual and myself, only to discover that it wouldn't be very easy to correct. When I'd changed the key signature to the correct one, sharps appeared in front of all the notes that had been entered as sharp due to the old key (which had too many sharps), just as I'd expected. Now all I'd have to do is change the pitches of the notes that have sharp signs in the display, but not in the sheet music.

Mountain Computer has a "change duration" command which changes the duration of a note without changing the pitch. They also have a "change pitch" command that I thought would change the pitch of a note without changing its duration—exactly which I wanted to do. I soon discovered, however, that "change pitch" simply deletes a note and requires you to enter it again—it doesn't just change the pitch. Clearly, it was easier to type NEW and reenter the song, so I did. This is the worst sort of blunder you can get into, where you pretty much have to start over. Correcting a key signature error isn't particularly easy with any music system I've seen. However, Mountain Computer could have made it easier by including all *three modes of error correction:* replace, insert, and delete.

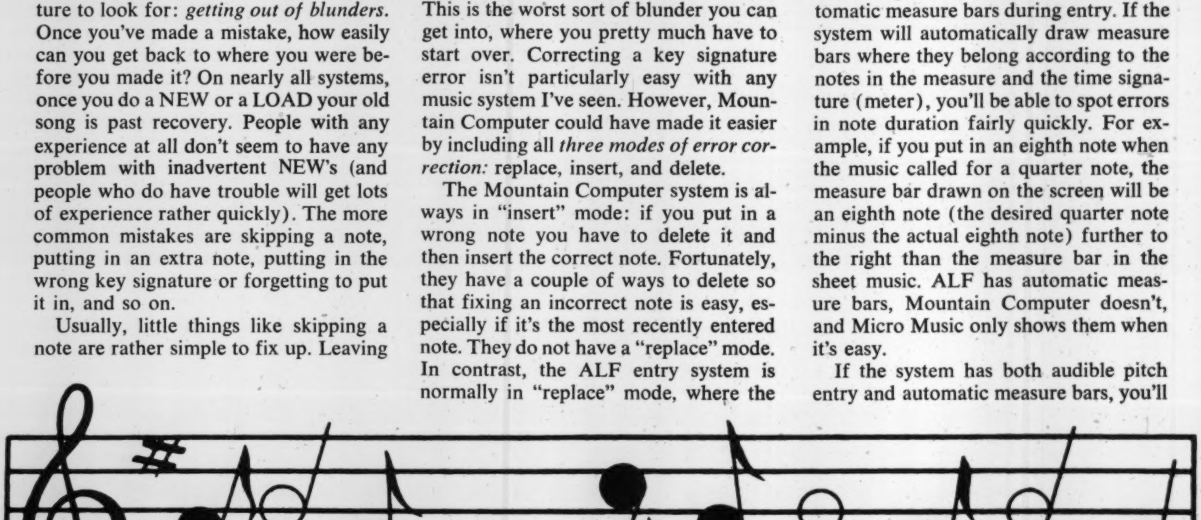
The Mountain Computer system is always in "insert" mode: if you put in a wrong note you have to delete it and then insert the correct note. Fortunately, they have a couple of ways to delete so that fixing an incorrect note is easy, especially if it's the most recently entered note. They do not have a "replace" mode. In contrast, the ALF entry system is normally in "replace" mode, where the note under the cursor is replaced by any new note you might put in. (Most systems have a "cursor" which is used like Apple's flashing text cursor, to indicate which letter, or note in this case, is being acted on.) Using replace mode, I could fix that incorrect key signature by stepping the cursor through all the notes, and reentering any sharp notes without having to delete them first. (I would have to select the proper note duration too, just like with the Mountain Computer setup.)

The ALF entry system also has an "insert" mode, where all entered notes are inserted in front of the cursor, which can be turned on and off by the user. Delete commands are also available.

The version I have of the Micro Music system has by far the worst editing of the three systems I've been focusing on, it has neither delete nor insert. If you make a mistake—forget it. Only certain types of errors can be laboriously edited, if you skip or duplicate a note you must start over from that point. A really good system will let you change any particular item or setting without having to change the others or start over.

Finding blunders easily is the first step in fixing them. There are two main features that allow for easy checking. The first is audible pitch entry, where the note being entered plays through the music card. This allows you to hear a wrong note as soon as it is entered. ALF and Micro Music have this feature, Mountain Computer doesn't. The second is automatic measure bars during entry. If the system will automatically draw measure bars where they belong according to the notes in the measure and the time signature (meter), you'll be able to spot errors in note duration fairly quickly. For example, if you put in an eighth note when the music called for a quarter note, the measure bar drawn on the screen will be an eighth note (the desired quarter note minus the actual eighth note) further to the right than the measure bar in the sheet music. ALF has automatic measure bars, Mountain Computer doesn't, and Micro Music only shows them when it's easy.

If the system has both audible pitch entry and automatic measure bars, you'll



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be able to spot and fix almost all errors as you go along. This is much easier than finding out there's a problem when you play the whole song, and then having to find it.

Editing

When you can find errors as you go, then fast, *easy editing* is important. With the ALF system and the Mountain Computer system, when an error is made you more or less just back up and fix it. With Micro Music system you must leave "compose" mode and then use the EDIT command to fix the problem (although, as already mentioned, some problems can be "fixed" only by reentering from the point the error occurred).

When you're going back to fix an error you didn't notice, or maybe just to insert an embellishment, you'll need *easy cursor movement*. The Micro Music system allows you to play your song slowly, while the sheet music is displayed, and then stop it at any point. A reference number is displayed, and you can edit at that reference number. The Mountain Computer system allows you to step through the sheet music one note at a time (very slowly), plus has commands to go to the current position in any part, and a command to go to the beginning of any measure (in which case you must have manually entered measure bars at the correct places).

The ALF system allows you to step through the sheet music one note at a time (quickly) either playing the pitches or not, plus has commands to go to the current measure in any part (or to the beginning of any part), and a command to go to the begining of any measure (and of course you don't have to put in the measure bars since they're automatic). Look for both these features: step through note-by-note, and zip over to a particular measure.

Another factor in editing is *program speed*. If you constantly have to wait for the program to get finished with what you did last, you'll get quite annoyed. Expect programs written in Basic to be the slowest, and programs written in assembly language to be fastest. This is not always the case, however. The Micro Music software, written in Basic, seems to be faster than the Mountain Computer software, which is written in XPLO (a low-level relatively fast language written by some people out in my neck of the woods—Denver). The ALF software is written in 6502 Assembly Language and is considerably faster. Most systems keep the main program and the song you're entering in memory. Mountain Computer is one of the rare exceptions.

Apparently Mountain Computer couldn't get everything to fit, so they store the parts they're not using at the moment on disk. This is probably the biggest annoyance in using the Mountain Computer system. If you use an obscure command, you have to wait while it reads it from disk; then when you go back to non-obscure commands, you have to wait while it reads them from disk! Just to play your song, you have to save it on disk, read in the menu program from disk, use it to read in the playback program from disk, read your song from disk, read the sound definitions from disk, and (finally!) play the song. Then to get back you have to read the menu program from disk, it reads the editor program (or at least part of it) from disk, then you can load your song from disk. Not including playback time, it takes about half a minute for even the smallest song. So, look for a system which doesn't use the disk once it gets going (except for saving and loading songs, of course) and which doesn't have annoying execution pauses.

Accidentals

Another factor which plays a big part in ease of entering is *accidental handling*. Insist on automatic key signatures. This lets you specify the key signature, and notes will automatically be sharped or flatted as indicated by the key. Just about everybody has it, although some allow only one key signature, which is used throughout the song, and some allow you to change the key at will. One interesting point is that the Mountain Computer system allows up to seven sharps or flats, while the ALF systems allow only six for some strange reason. Even once you've got the key signature going for you, there will still be some notes, called "accidentals," which are sharp or flat regardless of the key signature, or natural to cancel out a sharp or flat. I think everyone allows you to enter notes as sharp, flat, or natural; but some systems display only sharps (or only flats, or only whatever the key signature is using). The reasoning behind this is that, for example, "A" sharp and "B" flat have the same frequency (in an equal tempered scale), so why bother with two notations? Musicians turn purple and scream incoherently when you mention turning sharps into flats, but the average user should only be concerned with whether or not he'll be able to compare the sheet music and the screen easily when the notes are changed on him. We found no difficulty in displaying the notes as entered, sharp or flat, but Mountain Computer changes everything to whatever the key is using. On the other hand, Mountain Computer allows direct entry of double sharps and double flats, whereas on the ALF system you'd have to go up (or down) a half-step yourself.

[I'd like to digress a moment to mention a recent letter I received claiming our ad which joked "Announcing the music card that turns you into a Rock Star. Girls will climb over each other to kiss your feet" in the September '80 issue of *Creative Computing*, was "sexist" and implied that only males could operate music cards. Actually, having pictured a male we could hardly say "Boys" will climb over each other" and "People will climb over each other" doesn't seem to make it. So before you all write to me about "he'll be able" and "changed on him," dig out your dictionaries, because it's not sexist. The masculine forms include the feminine when speaking in general (and thanks, Heinlein, for pointing that out). So take heart and quit perverting English with s/he's!]

Standard sheet music requires that any accidental continue throughout the measure. That is, if a note is sharp, it should stay sharp throughout the measure

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unless counteracted by a flat or natural sign. There is disagreement on whether or not this should affect all octaves, like the key signature does; in the ALF system we don't have it apply to all octaves. Although very few systems have this feature, it is handy and you'll almost certainly make a lot of mistakes if your system doesn't have it. If the system has this feature but not automatic measure bars, you'll have to be extra careful to get the measure bars in the right places.

Pitch Range

Enough about editing, let's get on to song features. *Pitch range,* as discussed above for hardware, is important. Eight octaves, if they start at about the same place as a piano, are enough for almost anything. Fewer octaves, preferably right around middle "C," limit you somewhat. Most systems let you position a note on displayed staves to set the pitch. Some require you to type note codes, like CS4 for "C" Sharp in the fourth octave. Octave numbers can get to be annoying, and you'll find you have a lot of notes that are off an octave or two (these can be really difficult to hear or find). The most amusing scheme I've seen is Mountain Computer's, which uses both staves and octave numbers. The displayed music on this system may look like the sheet music, but it's only right if the octave number shown on the screen has the right value—and they don't bother to tell you what the octave numbers mean (with respect to frequency in Hz or standard pitch names) or which number is the right one! I had to find out by playing a note and comparing it to another music card. So, look for a system which displays pitches in standard positional notation, so it is easy to compare what you've entered with the sheet music.

Another feature is *note durations.* Most music is made up of whole notes, half notes, quarter notes, eighth notes, and sixteenth notes. A half note plays half as long as a whole note, a quarter note a quarter as long as a whole note, and so on. Many songs also use even shorter notes, thirty-second notes, sixty-fourth notes, and so on. Lots of songs use dotted notes. A dotted note plays three-halves as long as a non-dotted note.

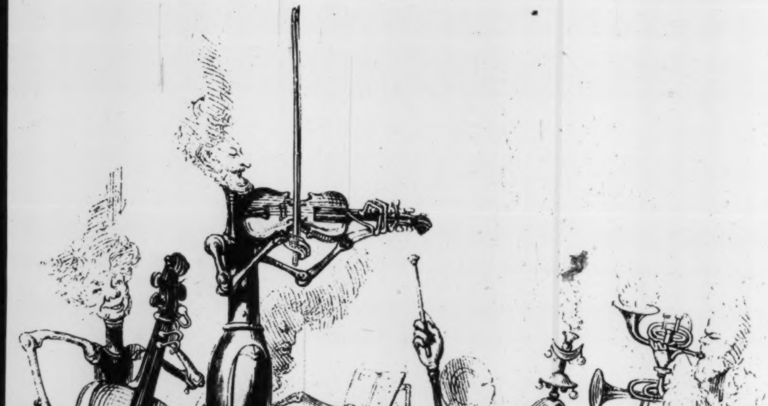
For example a dotted quarter note plays as long as a quarter note and an eighth note combined. These note duraitons are pretty much required for normal music entry.

You'll quite often also find notes that are "tied" together, which means to play two or more notes as if they were one (they all have the same pitch, otherwise they're "slurred" notes). Tied notes serve two purposes: to make notes longer than whole notes (for instance, tying several whole notes together to make a note that plays for several measures), and to make more complex note durations (for instance, tying a quarter note and a sixteenth note to make a note that plays a little longer than a quarter note).

Another popular note duration involves "triplets." A triplet note plays for two-thirds as long as a non-triplet note. This lets you play three notes in the space of two. Look for a system that has as many different note durations as possible.

Generally, rests can be entered with any note duration available for notes. The ALF system has a particularly clever/obvious system for note durations: each note has a stored duration in "time periods," each time period being variable in duration at playback, but roughly 1/400th of a second. Usually a quarter note is stored as having 240 time periods, so an eighth note would have 120 and so on. A triplet quarter note would have 160 time periods. A big advantage of this scheme is that unusual note durations can be obtained. For example, if you want five notes to play in the space of one quarter note, you can enter notes that are each 48 (240/5) time periods long. Just about any obscure notation can be constructed. Additionally, you can change the 240 time periods to a quarter note scheme and make a quarter note have any desired number of time periods (the other durations change proportionately) to change the song speed.

Another important aspect of note duration has to do with delays. I've mentioned before that timbre changes and echo, reverb, and similar effects can be achieved by playing the same thing on two channels, but with one channel delayed. The delay is almost always done by using a very short rest. If your smallest note is a thirty-second note, you'll only be able to get a delay that's 1/8th as long as a quarter note. Using ALF's "time periods" scheme, a one time period delay creates a delay 1/240th as long as a quarter note! This gives you more leeway in choosing delay values.



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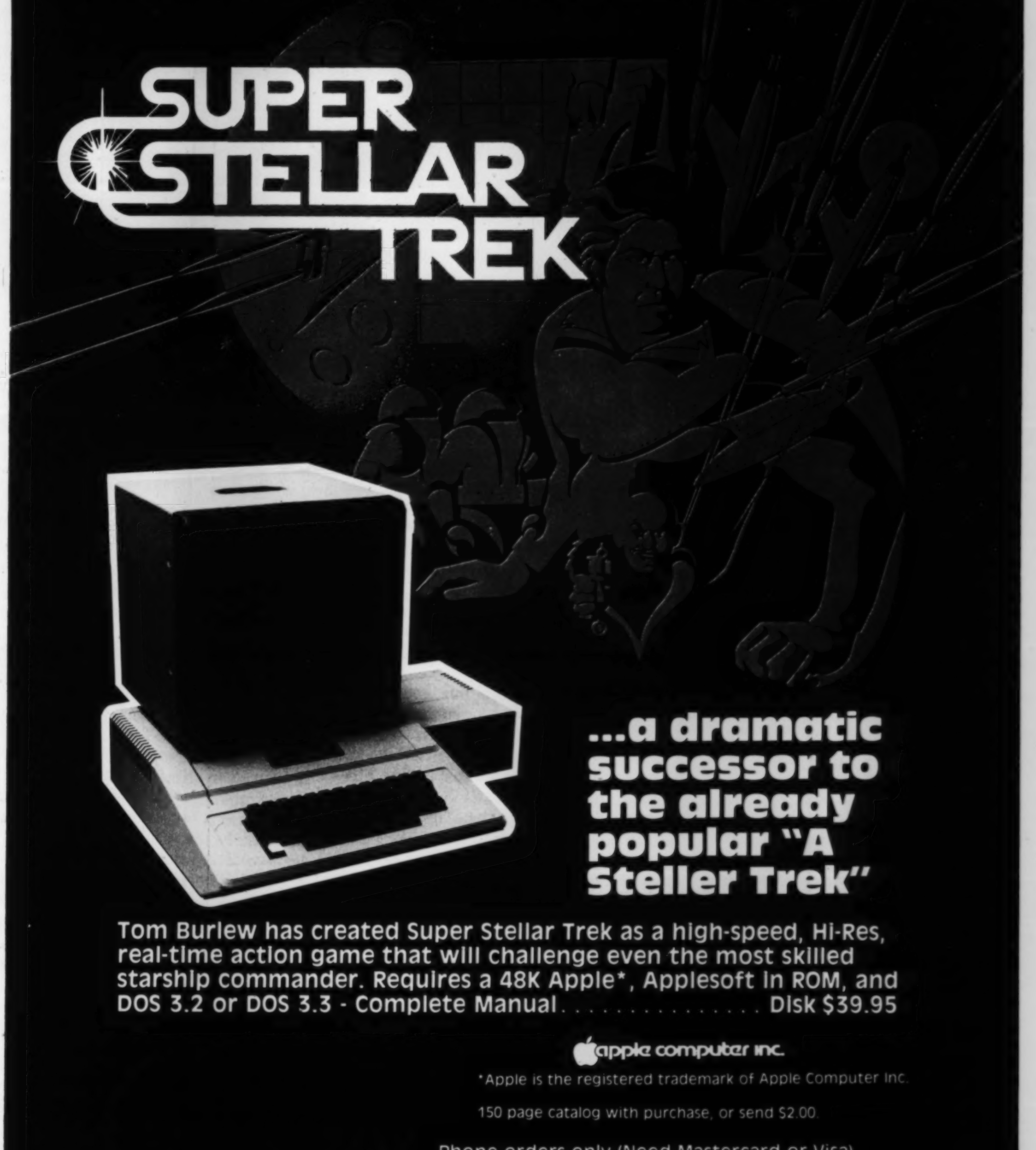

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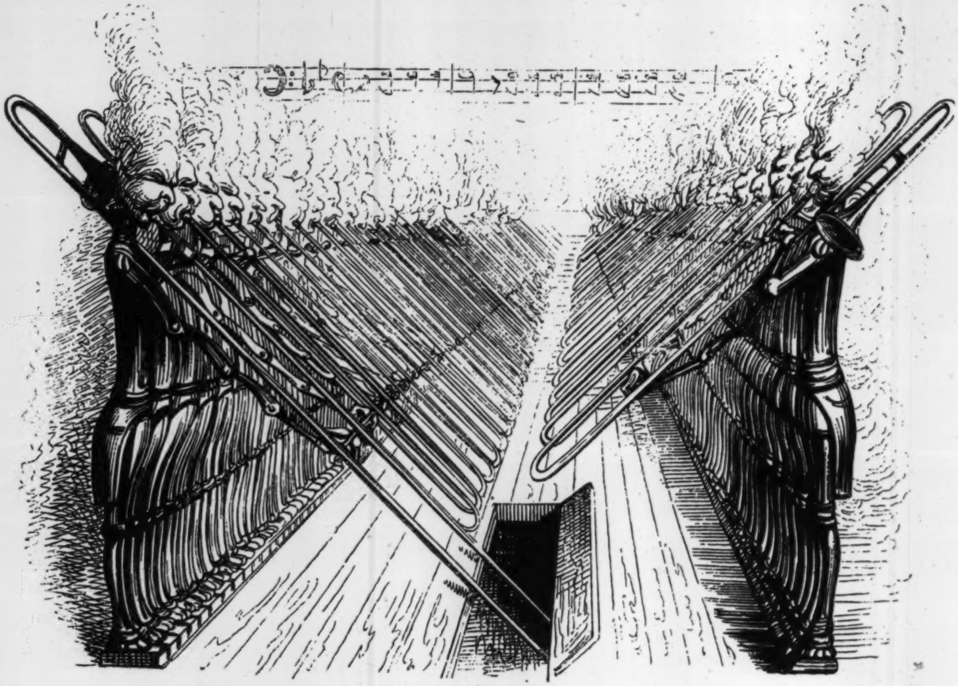


Subroutines

The next feature to consider is *subroutines* or whatever the system uses to repeat sections. Music often involves long repeated sections. Sometimes all parts (voices) will repeat a section, that's the classic "repeat"—great for songs with several verses, Sometimes the background parts, maybe just the bass line, will repeat over and over again throughout the song, maybe deviating for a measure or two every once in a while. Sometimes one part will play a theme, and then another part will; when they overlap it's called a "round" or fugue. The first inclination is to use the "start of repeat" and "end of repeat" marks that standard music notation uses (plus "first ending," "second ending" and the like). Fortunately most people don't actually use this scheme. It would be very limiting.

Definitely look for a system that has some way to repeat sections, preferably for the three types of repetition listed above. Otherwise you'll have to re-enter each section as it is repeated, which takes lots of time and consumes lots of memory. The best method I've seen simply steals the idea of "subroutines" from Basic or Assembly Language, or about any language. The only trick is that the person writing the system has to be sure the subroutines are re-entrant so they can be called from several parts at the same time (or at overlapping times). In the ALF system, you're allowed 100 subroutines which are numbered 0 to 99. You can program a melody, or changes in an envelope, or whatever, in each subroutine. These subroutines can be "called" from any part or from another subroutine. During playback, whatever is programmed in the subroutine plays (or changes the envelope, etc.) when it is called. If you program an entire melody in a subroutine and call it from all parts, but put longer and longer rests in front of each part, you've got a round. Put a melody in a subroutine and call it from two parts after setting different sound parameters in each part, and you've got a more complex sound.

Some systems have features like variable transpose, which lets you play a subroutine with the pitch raised or lowered by a certain amount; this lets you play a melody as written in one part (or at one time) and, say, an octave higher on another part (or at another time). Look for a system with advanced subroutine or other repeat features, and also watch for features like variable transpose.

Another feature is *tempo control*. You may want to have some sections of your song play at different speeds (tempos) than other parts. Mountain Computer seems to have the most tempo control, featuring both "set tempo" commands (in Italian or with numbers) and "increase" and "decrease" commands. Most systems have no tempo provisions (except a way to vary the speed of the entire song), or clumsy ones, like ALF's scheme for changing the time period note length base. ALF's MC16 has a variable tempo control which uses a hardware timer, but it requires additional hardware which is sold separately. Obviously, the more tempo control you can get, the better.

Most systems use a "one voice at a time" entry scheme, where you break the music down into separate voices, and enter each voice separately. There are many good reasons for doing it this way, but musicians complain (loudly) that it is difficult to read/understand music displayed one voice at a time. One of the main reasons for doing this is that it lets you specify the volume, for example, of each voice separately without having to assign the volume to each note separately. This assumes that you break the song down into parts in a consistent and reasonable fashion.

One unusual scheme is Mountain Computer's which mainly uses a one-part-at-a-time scheme, but also allows chords to be input. If the same number of notes are used in each chord, in a chord-progression background for example, this can simplify entry considerably. You have to be careful not to use it to put in an occasional chord in a melody or you'll run out of channels rapidly. Naturally, all notes in the chord must have the same duration. Having used both the one-voice-at-a-time method and the all-voice-at-once method, I can strongly recommend that you use the one-voice-at-a-time system (or a combination like Mountain Computer's).

SPECIAL FUNCTIONS AND ACCESSORIES

Probably the most popular special function is *sequenced playback*, which allows you to play several songs in a row. It is available under various names, ALF's is called DISCO and is supplied with each card, Micro Music's is called Auto Digisong Player and is sold separately. Some cards have *playback subroutines* available which are subroutines you can add to (or call from) your own Basic programs; their uses range from sound effects to full song playback. Again, ALF cards are supplied with a playback subroutine (the MC16 has two, one for chromatic sounds and one for full playback) and the Micro Music one is sold separately. (The Mountain Computer card is a little too new to have these features available.) Some cards are supplied with tutoring programs that describe synthesizer features while playing them.

The most popular accessories are *pre-programmed albums* which consist of songs already programmed that can be loaded and played back easily. The smaller companies don't usually have many song disks available because it is difficult to decipher the "compulsory license" provisions in the U.S. coypright law. (Despite the controversy surrounding copyright of computer programs, pre-programmed songs are simply a complex method of sound recording. They therefore qualify for the "circle P" sound recording copyright law, which most companies take advantage of. This law is quite clear, and if you plan to make a mint copying other people's songs, you're in for large scale trouble.)

Right now, the largest collections of songs seem to be available from ALF and Micro Music. ALF's "Album O" includes a program which lets you buy Micro Music's songs and play them on your ALF cards, assuming Micro Music hasn't changed their format. Micro Music's songs are grouped by flavor, I've seen "Christmas Wonderland," "Dixieland Swingers," "Hymn Favorites," "Disco, Rock & Jazz," and "Red Hot Bach"; price was $19.95 each. Some ALF "Albums" are grouped: Album 0 and Album 4 are both Christmas songs, Album 5 and Album 6 are "single artist" albums where the songs were entered by approximately one programmer. ALF buys songs that are submitted by customers, and many of the Album songs were obtained that way. The "non-ALF" people are listed at the bottom on the back of each album, so you can tell which songs are customer songs and get an idea of what people have done on their own. ALF Albums sell for $14.95. Both Micro Music and ALF song disks seem to have around a dozen songs on each disk.

ALBUM SERIES
ALBUM 1
ALBUM 0
ALBUM 2
ALBUM 3
PROCESS
ALBUM 4
SAUTER
ALF PRODUCTS
EAR-TRAINING
DAVID EXOTIC'S GREATEST HITS

Some of the albums available for the ALF MCI and MC16 synthesizers.

Another popular accessory is *programming aids*. Micro Music offers their do-it-yourself subroutines (mentioned above) and their envelope shaper package. ALF offers a set of six programs in a package called "Process & Other Programs" that vary from a tutorial program on envelopes to a move big-chunks-around editor. American Micro Products offers "Flash and Crash Sound Effects" and their "Advanced Music Editor."

Demo records are often available, although as I've mentioned they usually have so much noise (and other problems) that they don't give you a good idea of what the music card sounds like. ALF offers a seven inch record of the MC1 music card for $1, and Micro Music offers a cassette for $5. Creative Computing sells a high-quality twelve-inch record of the First Philadelphia Computer Music Festival for $6.

Educational software is also popular. Micro Music has the biggest selection, with "Maestro's Magic Speller," "Music Lover's Guide to Musical Symbols," "Music Lover's Guide to Italian Terms," "Music Lover's Guide to Musical Instruments," "Music Lover's Guide to General Terms," "Melodious Dictator," "Rhythmical Dictator," "Harmonious Dictator," "Interval Mania," and "Chord Mania." Prices on the first ones are around $39, but many people balk at the $120 price tag on each of the dictator/mania series. ALF has a disk of four programs for $50 called "Basic Ear Training Skills" which starts at the very beginning of ear training.

DIGISONG PAK
DISCO, ROCK & JAZZ
HYMN FAVORITES
Dixieland Swingers
Red hot Bach:
a Bach Sampler
CHRISTMAS WONDERLAND
Magic Speller
Auto Digisong Player
Melodious Dictator

A selection of albums available for the Micro Music Composer.

There are some unusual accessories. Symtec offers a BSR Home Control System interface (although any synthesizer with a high enough pitch range can control the BSR system by emitting ultrasonic control signals, or you can connect an ultrasonic transducer to the Apple game I/0 connector and do it with software). Stereo music cards can be connected to an oscilloscope in XY mode to make pretty images, although no one sells songs just for that purpose yet. Micro Music offers a band uniform inventory program. It's rumored that Clone Software is working on a Sound-activated hypnosis program using a special circuit card and headphones.

Finally

One last tip for making your choice. If you're getting a demo at a local dealer, ask to read the owner's manual. If you can't borrow it from a dealer, you can probably purchase one from the manufacturer (be prepared to pay $5 to $10 —you wouldn't believe what manuals cost to print!). It will give you some insight into the particular hardware/software setup, and show you how to program songs. And since it's written by the manufacturer and not by the competitor, it will show the system in its best light. ☐

This article was prepared in January, 1981, and evaluates the products based on the features available at that time. The field of music synthesis is changing rapidly, and readers are advised to check with dealers or manufacturers regarding updates and changes in hardware and software.

Plotters:
Large and Small
Simple and Sophisticated

Carl Warren

Figure 1. The Calma system.

Figure 2. The Calcomp plotter.

Plotting systems which were once thought of as large flat bed systems supported by large computers, or on the low-end relegated to data logging chores, are finding use in such diverse applications as automobile design and simple display advertising layout.

Users ranging from General Motors to small electronics shops are finding that the new units provide greater productivity in design work. Moreover, in the case of the small desktop plotters, users find that heretofore dull data can be depicted in a much more palatable and understandable manner—through four-color graphics.

This ability to create meaningful graphics from digital data isn't the only feature these instruments provide, however. Regardless of size, plotters offer many attributes, of which some are application dependent. These attributes include:

- Fine resolution. This is the smallest addressable move the plotter writing head can make.
- High plotting speed. This varies depending on the type of plotter.
- Plotting bed sizes that range from room size to units that use an 8.5" x 11" standard sheet of paper.
- The ability to use a variety of drawing material from paper to plastic.

Typically, plotting systems range in price from over $100,000 to less than $1200, depending, of course, on their capabilities.

An example of a large computer-aided design/computer aided manufacturing (CAD/CAM) system is that offered by Calma (Santa Clara, CA). This company combines plotters from a variety of manufacturers into a complete system with minicomputer support and digital drafting input (Figure 1).

Systems such as that offered by Calma, aid designers in such diverse areas as mechanical design and printed circuit board layout. By employing the power of a minicomputer combined with digital drawing boards, designers are able to develop designs, and create drawings in a fraction of the time it would take using manual methods.

Manufacturers such as Calcomp provide a wide range of plotters from large full sized bed plotters (Figure 2) to smaller desktop units. The Calcomp units are used by integrators like Calma in CAD/CAM applications.

Of course, not all high-end plotters are of the full bed size, many units aren't much larger than a standard line printer. Hewlett-Packard and Houston Instruments, for example, offer plotters with similar looks and attributes (Figures 3 and 4). Both units solve the traditional problem of full-sized bed plotting in a non-traditional manner by using an airfoil to move the paper, rather than moving the plotting carriage.

Both the HP 7580A and the Houston Instruments CPS-14 move the medium in one direction over the airfoil-shaped bed while a light weight pen carriage moves perpendicularly to the direction of motion

Figure 3. The Houston Instruments CPS-14.

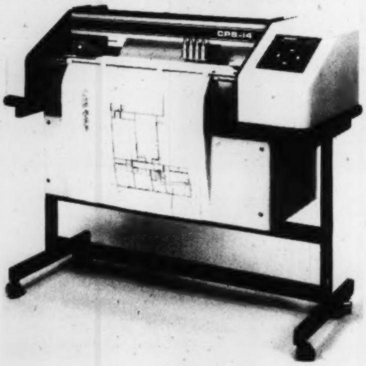
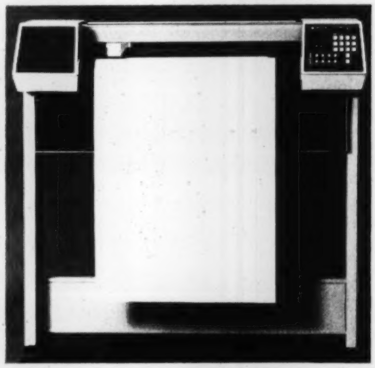


Figure 4. The Hewlett Packard 7580 A.



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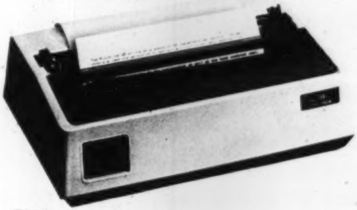

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A Plotter Glossary

Addressable step size—The smallest move that a plotter can make and still maintain accuracy.

Motor resolution—Parameter that affects the accuracy of a plotter; measures the degree to which the positioning motor can achieve a specified step.

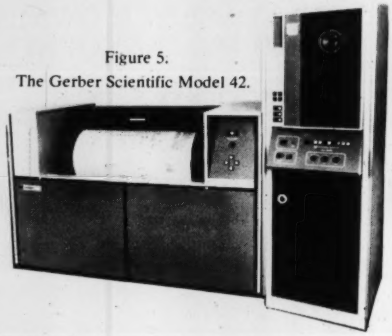
Plotting accuracy—Specifies how closely a drawing created by a plotter adheres to the actual data. Typically expressed in terms of percent of deflection for a given point. Takes into account such factors as linearity and repeatability.

Printhead or plotting speed—The speed at which a plotter can lay down a line of data. Expressed in terms of inches per second for both a linear path and a 45° angle.

Repeatability—Measures to what degree of plotting accuracy a point can be repeated. Expressed as a linear dimension.

Window plotting—Handling of off-scale data. Smart plotters calculate the mechanical limits available to them, thus preventing the unit from trying to plot data outside the physical limitations of the unit.

Figure 5.
The Gerber Scientific Model 42.



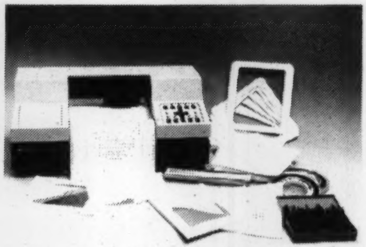


Figure 6. The Nicolet Zeta Model 1453 B.

of the medium. Typically, the units exhibit resolutions of 0.001" with speeds up to 24 ips.

Units such as this handle a full range of pens from fiber-tip to drafting pens. Moreover, both units can be manipulated using either the built-in front panels or host system control.

If you like a drum plotter and seek high speed, you might want to consider Gerber Scientific's Model 42 (Figure 5). This high-performance system sports a maximum plotting speed of 1200 ipm, on a medium that can be as large as 36" x 48". Furthermore, the unit can produce either color or black and white plots.

Nicolet Zeta Corp. produces a plotter that can be viewed as a bridge between the large systems and the desktop units. The Model 1453B four-pen plotter (Figure 6) is designed for business and engineering applications. The Model 1453B sports a fairly healthy price tag of $8950 and an impressive lineup of features. Some of the features include; programmable four-pen plotting with full 11" wide plotting area, continuous feed paper for unattended multiple-plot operation, built-in microprocessor controller, and both RS-232 and IEEE-488 interfaces.

A plotter like the Model 1453B is excellent for producing cartographic (map) plots similar to the one in Figure 7 (page 120). Notice that in this type of plot, lettering, shading and finite resolution are combined to create the desired graphic representation.

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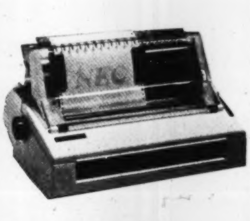

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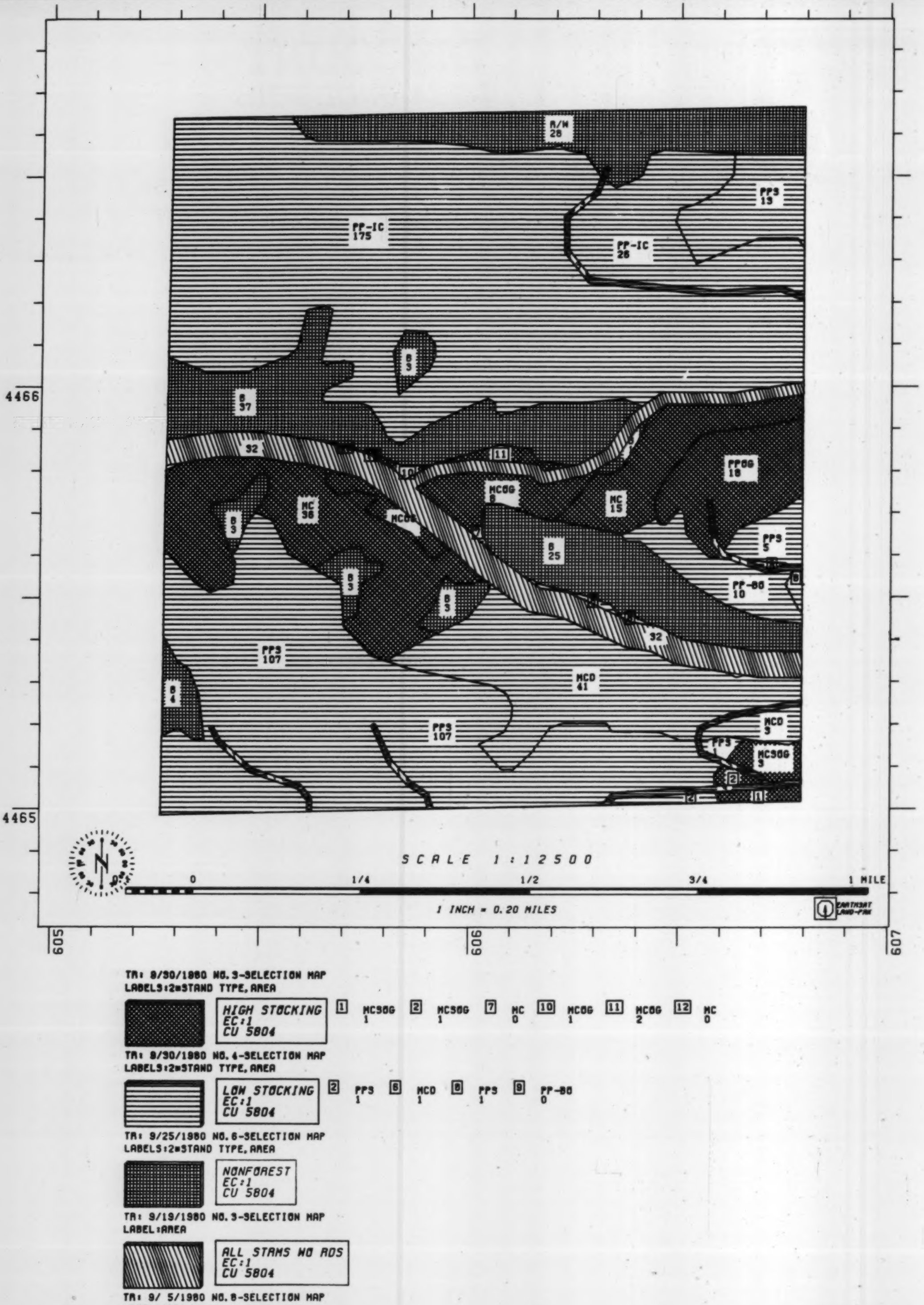
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PP-IC
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PP-BO
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2 MCSOG 1
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10 MCOG 1
11 MCOG 2
12 MC 0
TR: 9/30/1980 NO.4-SELECTION MAP
LABELS:2=STAND TYPE, AREA
LOW STOCKING
EC:1
CU 5804
2 PPS 1
6 MCO 1
8 PPS 1
9 PP-BO 0
TR: 9/25/1980 NO.6-SELECTION MAP
LABELS:2=STAND TYPE, AREA
NONFOREST
EC:1
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TR: 9/19/1980 NO.3-SELECTION MAP
LABEL:AREA
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EC:1
CU 5804
TR: 9/ 5/1980 NO.8-SELECTION MAP
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Figure 7. A four-color cartographic plot produced by the Nicolet Zeta 1453 B.

High-Resolution Color Graphics for the Apple and Atari

Graphics Breakthrough

How many programs have you written that would benefit from animated high-resolution graphics? Probably several. It is this kind of dramatic graphics that distinguish outstanding programs from ordinary ones. But if you've ever agonized for hours or days just to get one image perfected, you're probably not anxious to do it again. Now there's a better way.

New Graphics Entry System

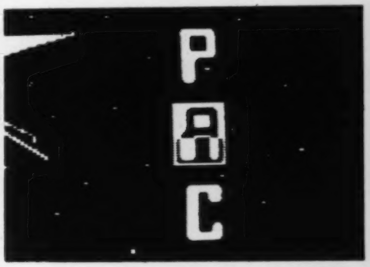
Today there is a new graphics system available that is not only amazingly user-oriented but surprisingly economical. Called VersaWriter, it starts with an ingeniously simple entry board consisting of a 14" X 12" high impact plastic bed with a tough clear plastic overlay sheet. The original drawing or diagram is fastened with masking tape to the plastic bed and then covered with the clear sheet. Instead of using a light pen or complicated electronic X-Y head, the VersaWriter uses a double jointed arm attached to the top of the entry board at one end and a magnifying lens with crosshairs at the other end. The VersaWriter resembles a draftsman's pantograph on a smaller scale.

At each joint in the arm of the VersaWriter is a potentiometer. A cable from these pontentiometers connects to the paddle input of the computer. No special interface electronics or board is needed. Since the arm of the VersaWriter bends only in one direction, each point on the plotting head corresponds to a unique set of resistances on the potentiometers. All that's needed now is software to translate these resistances into usable screen coordinates.

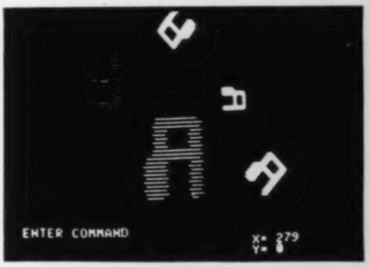
Exceptionally powerful software

It is in the software where VersaWriter really stands out. VersaWriter comes with two full disks of user-oriented software. First it has sets of "low level" commands for entering, creating and copying drawings and diagrams. Secondly, it has extensive sets of application routines for moving, enlarging, rotating, coloring or animating drawings that the user has created.

Of course the basic commands let you enter a drawing freehand or by tracing it. Want a wider "brush stroke"? Six widths are available. Drawings can be independently scaled in both the vertical and horizontal directions. An enclosed shape may be filled in with any of 212 colors. No, that is not a misprint—by the same technique that a printing press can create hundreds of colors from three primary ones, so can VeraWriter.



Here a shape (the letter A) is being scanned. After putting it in a shape table it may be used in other programs.



```
ENTER COMMAND                X= 279
                             Y= 0
```

From the shape table, a shape (the letter A) may be enlarged, shrunk, rotated, colored or moved about the screen.

Create Animation for Other Programs

The shapes you create with VersaWriter can be used and manipulated with ease in other programs. Up to 255 shapes can be entered into a shape table. These shapes may then be placed on the screen in any position or may be overlaid on a full or partial screen image. Animation is produced easily by moving about a portion of the image created by VersaWriter. For example, by alternating between two images of an airplane propeller it will appear to be spinning.

Other VersaWriter software includes text-writer with which text can be added to graphics. Upper and lower case, choice of color, text size, direction and starting point all may be specified.

The Area/Distance program lets you calculate distances (or perimeters) by entering a scale and tracing a shape or map route with the drawing arm. Areas of figures, open and irregular, can be similarly calculated.

The software also includes sets of electronic and computer logic shapes. In addition, an entire disk of dramatic demonstration graphics is included. These twelve full-screen graphics run the gamut from a fully labeled cross section of a human skull to colored maps to animated cartoons to an electronics schematic.

Free Software Updates

You may have read a review of VersaWriter that indicated that the color fill routine was slow. It was. But not anymore. Several new routines and improvements were added to the VersaWriter software since its introduction. All customers of Peripherals Plus received these changes free.

As new updates are developed, Peripherals Plus will furnish them free to all customers FOREVER. We make this unique guarantee because it is in our best interest to have you make the best use of your computer. We're convinced that if other people see your VersaWriter in use, they'll want one too.

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At Peripherals Plus, we evaluated every graphics entry device. We wanted to handle the best one regardless of price. VersaWriter has the best performance bar none. Surprisingly it also has the lowest price, just $249.00 for the Apple version.

VersaWriter requires an Apple II with Applesoft in ROM (or an Apple II Plus), disk, and 48K of memory. The Atari version requires an Atari 800, disk and at least 32K. It is priced at $300.

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They Get Smaller Still

As capable as the large plotters are, the real excitement is with the smaller desktop units. Previously, small plotting systems were nothing but XY records used with data-logging systems. Now, by incorporating microprocessor control and better software, the small desktop systems sport resolutions as fine as 0.001", have writing speeds up to 15 ips, and can handle the same media as the larger units.

To appreciate modern digital desktop plotters fully, you must realize that as Houston Instruments Marketing Manager Roy Bower puts it, "a digital plotter is not an XY recorder. The latter is an analog instrument, usually employed in high-usage data-logging applications such as seismic reading. XY recorders incorporate servo motors and, unlike plotters, cannot handle perspective in the data presentation."

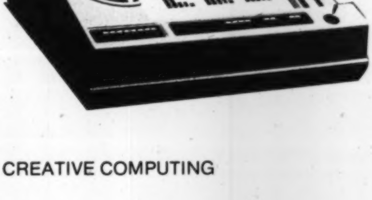
> ***As capable as the large plotters are, the real excitement is with the smaller desktop units.***

Furthermore, the XY recorder doesn't have the accuracy of a digital recorder due to the fact that servo motors operate in a closed loop. Accuracy, therefore, is a small percent of the recorder's full-scale move.

Typically, two types of technology are employed in a digital plotter. For high-use applications, such as printing weather maps, electrostatic printing is used. These plotters carry price tags in excess of $10,000 even for low-end units.

Plotters that are designed to operate in desktop environments normally use some type of pen arrangement. The Tektronix Model 4662 (Figure 8), for example, uses a multiple pen arrangement. One pen at a time is in contact with the paper; the

Figure 8. The Tektronix Model 4662.



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Plotters, continued...

others are automatically picked up. Other plotters such as the Houston Instruments Model DP-3 (Figure 9) are designed for dedicated applications and use only one pen. Both plotters are priced under $7000.

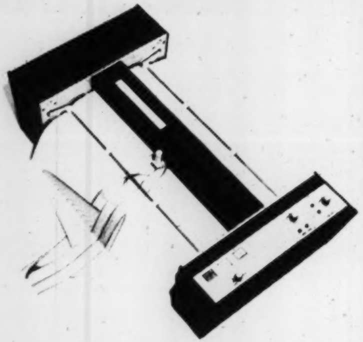


Figure 9. The Houston Instruments Model DP-3.

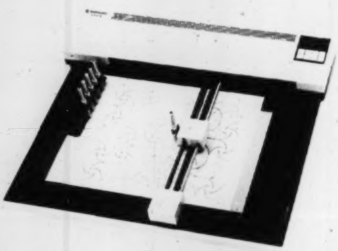


Figure 10. The Watanabe Model WX4675.

Using a similar interchangeable pen approach is the Watanabe Model WX4675 (Figure 10). This $1700 plotter uses a simple system to pick any of six pens, and operates at a fairly quick plotting speed of 50 mm/sec. In addition, the plotter interfaces to the host via a Centronics-like 8-bit parallel port. To further enhance the plotter a series of plotting commands is included in this firmware of the unit.

The complete system approach to the graphics world is offered by Hewlett Packard (Figure 11). This system, which

Basics of Plotting Software

Although most of the software available for plotter systems, is written in Fortran, the small desktop units work equally well with routines written in the popular Basic language.

For the most part, the desktop units employ a fair amount of intelligence and have as part of their operating repertoire a full plot command list as well as unique character sets. For this reason, simple Basic language routines can be written to invoke needed functions.

Take for example a data list, that draws a garden variety business graph. If the plotter was dumb, the programmer would be required to tell the plotter to drop its printhead to plot and raise it when done. Each point would have to be taken into account and a fairly long program would be required. By using the built-in smartness, a typical routine might look like this:

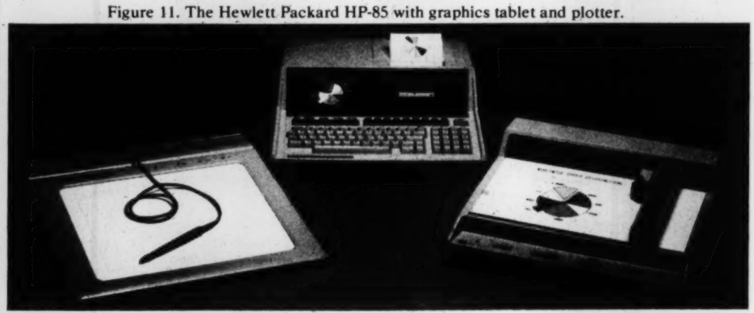
```
10 CLEAR: CLOSE:
20 G=“PLOT”:G1=“CIRCLE”:G2=
   “BAR”:G3=“SCALE”
30 OPEN “I”, 1, “WORK.DTA”
40 READ 1, A
50 OUT 2, G3   ‘FIRST VARIABLE
   SETS SCALE
60 OUT 2, G,G2   ‘BEGIN PLOT
   MAKE BAR GRAPH
70 END
```

Even though this isn't a working program, it illustrates the use of graphic primitives.

Interestingly, even though the plotter can handle a good percentage of the graphic need by calling routines from the character set PROM, it frequently is useful to do the necessary calculations in system memory and send nothing more than a data stream interspersed with plot commands to the plotter.

When this method is employed, extremely difficult plots can be carried out on even the most inexpensive plotters. Software for doing such calculations, can be found on such time sharing systems as Micronet and The Source.

Figure 11. The Hewlett Packard HP-85 with graphics tablet and plotter.



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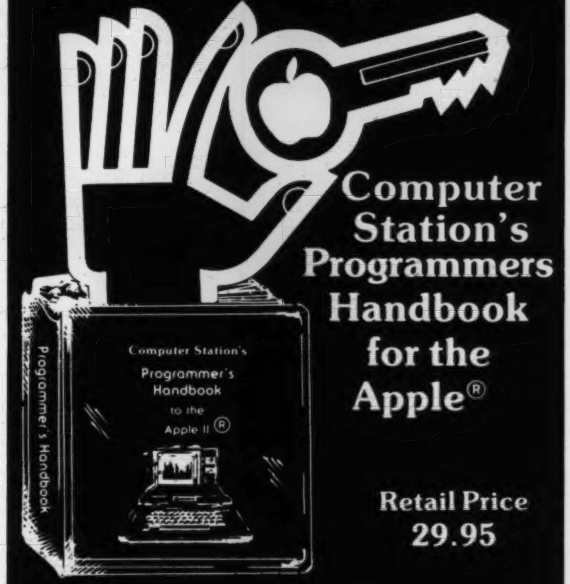

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is priced under $15,000, includes the HP-85 personal computer, a graphics tablet, and the plotter, all designed to fit on the table top.

An important feature of the HP system is that it is available with a variety of software designed to solve a wide range of problems.

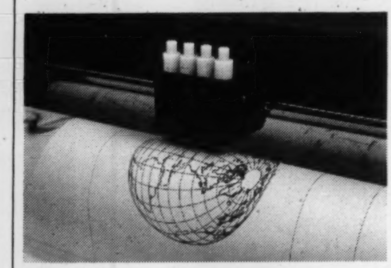


Figure 12. Close-up view of the Calcomp print mechanism.

Accuracy, A Dual Matter

Since accuracy can be critical to various types of plotted graphs, plotter manufacturers employ several methods to ensure that a plot is as accurate as possible. For example, Calcomp employs a multiple printing mechanism to increase plot throughput, but also to ensure that multiple lines are laid down in exact accordance with other lines (Figure 12). The resulting plot, such as the one shown in Figure 13 is usually accurate to within several thousandths of an inch.

Of course the mechanics of the plotter are only a small part of the accuracy or the ability of the plotter to create the graphics picture.

The plotter manufacturers are realizing that, as with other types of peripherals, most users want smarter units. Consequently, most of the units, including the large bed plotters, incorporate microprocessor control, as well as character generators that can produce unique character fonts. Some units even include special microcoded PROMs for complete system control.

Nicolet Zeta's VP for marketing, Gary Hasenfus explains: "Since plotters are being used in applications that no one would have thought of five years ago, they must be a lot smarter and more accurate."

Software

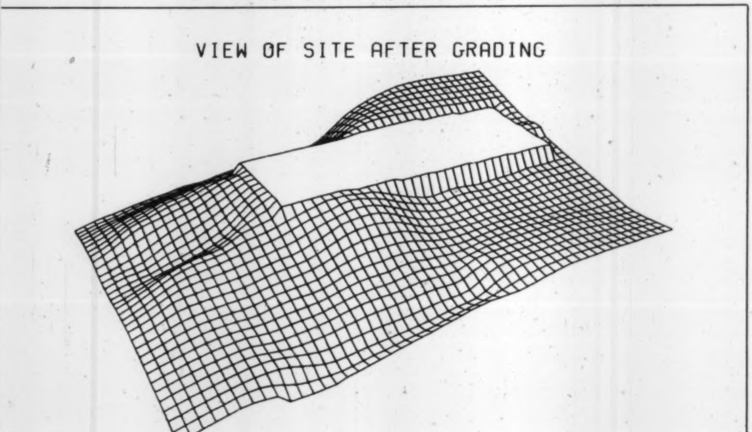
Several software houses have developed software packages to take advantage of the intelligence that the manufacturers have built-in to the units.

To enhance the usability of their plotters, Nicolet Zeta offers several software packages. For example, the Fundamental Plotting Subroutines (FPS), is a Fortran package which provides such primitives as PLOT, LINE, AXIS, SCALE, and SYMBOL. Other packages include a $750 business graphics package called ZCHART designed to enhance business presentations, and a really unique package dubbed TYPSET. This $500 software treat lets the user produce well over 1300 different characters from Cyrillic to punctuation marks.

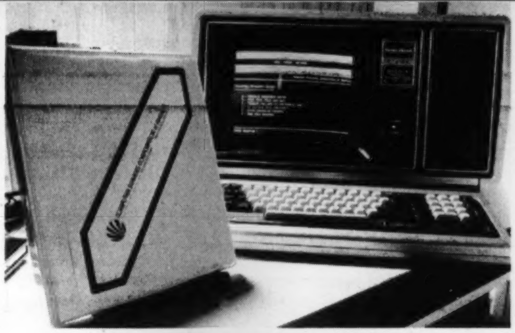
Not to be left out in the cold, Watanabe, working in concert with West Coast Consultants, has developed packages for the Apple, Commodore PET, TRS-80, Atari, and NEC (PC8001) microcomputers. These packages carry a price tag of $200 and offer such capabilities as developing curves and translating other digital data to understandable graphs.

Taking advantage of the capability of desktop plotters, is Sorcim (Santa Clara,

Figure 13. A plot produced by the Calcomp plotter.



SOFTWARE PRICE WAR



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[†] Microcomputers for Business, Applications, 1979

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CA). According to company president Richard Frank, the firm's latest product, SuperCalc for CP/M, not only handles tabular information in a manner similar to that of Personal Software's VisiCalc, but will produce graphs, and charts on a digital plotter. Mr. Frank, feels that since more small computer systems employ a serial terminal, rather than one with graphics features, it was only logical to build in this capability to a package like SuperCalc.

Unfortunately, most of the available plotter software is for larger systems, with only minor attention being paid to the smaller desktop units. This is changing, though, since not only are users seeing the versatility of the small plotters, but so are numerous systems houses. One industry watcher speculates that within two years most systems will be offered with some sort of plotting option as standard equipment.

(For a review of the small computer oriented Houston Instruments HiPlot Plotter, see *Creative Computing*, Vol. 5, No. 6, pg. 28).

> ***One industry watcher speculates that within two years most systems will be offered with some sort of plotting option as standard equipment.***

For More Information

For more information on the plotters discussed in this article, contact the following manufacturers directly:

Calcomp, 2411 W. LaPalma Ave., Anaheim, CA 92801. (714) 821-2011.

Gerber Scientific Instrument Co., P.O. Box 305, Hartford, CT 06101. (203) 644-1551.

Hewlett-Packard Co., 1507 Page Mill Rd., Palo Alto, CA 94304.

Houston Instruments, 1 Houston Square, Austin, TX 78753. (512) 837-2820.

Nicolet Zeta Corp., 2300 Stanwell Dr., Concord, CA 94520. (415) 671-0600.

Tektronix Inc., P.O. Box 500, Beaverton, OR 97007. (503) 644-0161.

Watanabe Instrument Corp., 3186 Airway, Bldg D, Costa Mesa, CA 92626. (714) 546-5344. ☐

A one-hour LP record of eight synthesizers may change your views about computer music forever

Binary Beatles

by David Ahl

Computer music. Who needs it? It's mostly boring beep, beep, beeps or wildly modern stuff. It's certainly nothing you'd want to listen to more than once. That's what I thought about computer music and most of my friends agreed.

In 1978 I entered Yankee Doodle Dandy into my Software Technology system just to be different. Dick Moberg heard of it and asked me to perform in the Philadelphia Computer Music Festival. I agreed expecting to be the only one with something out of the ordinary. I was wrong.

Computer Accompanist

Nine individuals and groups performed in the festival. There were the usual Bach pieces but even they were different. Gooitzen van der Wal performed the last movement of the 2nd Bach Suite in a unique way. He played the flute solo while using the computer as accompaniment.

Then Dorothy Siegel did the same thing, playing the clarinet solo part of Wanhal's Sonata in b flat. The audience went wild.

Hal Chamberlin played Bach's Tocatta and Fugue in d minor. But also with a difference. He used a large computer before hand to "compute" the waveform of every instrument playing every note. It took one hour of computation time for each two minutes of playback time. The result could hardly be distinguished from the organ in the Hapsburg Cathedral.

Don Schertz had a home brewed synthesizer truly mounted on a breadboard that allowed him to control 25 parameters of each note. It produced spectacular sounds in his arrangement of Red Wing.

Singing Computer

In 1962, D.H. Van Lenten at Bell Laboratories produced the first talking computer. Bell engineers taught it to recite the soliloquy from Hamlet. Then they went one step further and taught it to sing Daisy both alone and accompanied by another computer. This was also performed at the festival.

Yes, the Beatles were represented. Andrew Molda played Hey Jude on his COSMAC VIP system with a program called PIN-8 (Play it Now).

Superb Quality Recording

All these pieces and twelve others were recorded with broadcast quality equipment. Because of audience noise, eight were re-recorded later in a studio. We then took these tapes to Tru-Tone, a top recording studio and cut a lacquer master. It was a long session since the recording engineers insisted upon analyzing the sound from every source and setting up the equilization curves accordingly. It took over 12 hours to produce a one-hour lacquer master.

Finished recordings were then pressed on top-quality vinyl and inserted into liners and record jackets. These were then shrink wrapped in plastic for maximum protection. We guaranteee that every LP record is free from defects or we will replace it free of charge.

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Before you spend $200 — or $2000 — on a computer system that won't meet your needs, read this.

Straight Talk About Buying A Small Computer

A personal computer. If you don't already have one you're probably thinking about it.

The Plunge

Spending a couple of thousand or even a few hundred dollars is not something you do lightly. Making a decision about which computer to buy is not easy. Deciding about peripherals is even harder. And making intelligent decisions about software is nearly impossible.

But there's a way. *Creative Computing*. It's the magazine with the toughest evaluations in the industry.

In an industry prone to dazzling sales pitches filled with technical doubletalk, some straight advice from an unbiased source could make a lot of difference. Some of the newest computers on the market will be extinct before the first orders are filled; others will achieve astounding popularity. Which would you rather own?

Why Buy One?

The uses of a personal computer would fill several books. Some people have a specific use in mind, others just a general desire to join the computer age. In general, it's advisable to have a good idea of at least one or two things you want a computer to do for you. If you want to analyze stock options, for example, you'll want a computer for which a stock option package is available. If you want to work with color graphics your choice of computer is narrowed to those units with high resolution color output. Even after you've chosen some applications, the choice of a machine isn't easy. Here are a few things that might help.

Hard and Soft

Besides encountering hard and soft sells, you'll also encounter the terms "hardware" and "software." Hardware refers to the electronic parts of a computer system, the circuit boards, chips, peripherals, and other components.

An important part of hardware is memory. The amount of memory a computer has determines how much it can do. Most people start out with systems having 16K (K is short for kilobyte, which means 1024 bytes, or characters like a letter or number) of memory. Later, many people decide to expand their systems, and buy more memory.

Some of the new computers can be purchased with as little as 1K of memory. They can usually be expanded, but the upper limit varies. If you want to play games and write short programs, 16K is adequate. If you want to add a disk drive, or do word processing, you'll probably need 48K or more.

By themselves, these parts are rather dumb. The programs that instruct the computer how to do the more interesting applications (stock option analysis, animation, play a game) are usually contained on magnetic tape or disks. This is software.

Both hardware and software are important. A system with the wrong hardware can be as worthless to you as a sports car would be for a six-member family. Some computers cannot be connected to a printer. Others can't be expanded without a great deal of additional expense. You may not need these extras now, but if you anticipate needing them later, you'll want to select an appropriate system now. And a computer without good software is just an expensive dust catcher.

The Software Cycle

When a computer first hits the market, the only software available will be from the manufacturer. This limits the uses of the machine. As soon as a computer becomes popular, new software pours from dozens of sources. But there is a catch. People won't buy a computer until there is plenty of software available. And vendors won't produce the software until people start buying the computer. Where does this leave you? You can go with one of the established computers, or take a chance on a new machine.

The Newcomers

New computers are appearing almost monthly. One might be right for you. Can anyone tell for sure which will survive? Probably not. But the new machines can be compared against the old. If a computer does everything and more than another does, and costs less, it has a good chance of catching on. If it does less than existing computers, and costs about the same, it is probably doomed.

The Survivors

A few computers currently have the majority of the market. They all have good points and disadvantages. One costs less to start with, but costs more to expand. Another has great graphics but no lowercase letters—a bit of a problem if you want to do word processing. The limitations of any machine can be overcome, for a price. But it is better to get what you want at the start. If you know what you plan to use the computer for, the first step is to determine what that use requires. Do you want to play games? Then you have to decide how important joysticks, paddles, and other controls are. Some computers are supplied with these attachments. Some companies sell these attachments as extras. Do you want to use your own television? Or would you prefer a computer that comes with its own monitor? Will you demand complicated math capabilities from your computer? Certain computers can only handle integers.

Your Choice

Where does this leave you? If you've read this far, you are probably concerned about making the right choice. The following hints could be a good starting place. Take your time, and don't let your first impression of any computer prevent you from taking an honest look at its good and bad points. All computers seem impressive at first. Once you've looked at a few, you'll find that the initial awe is replaced by cold comparison. If you have a specific application in mind, ask to see the computer perform that application. If the salesman starts talking in technical terms while assuring you the machine will do what you want with only a few modifications, find another store. Ask about warranties. Will it be repaired at the store or sent out? Will they provide a loaner during repairs? Is the dealer authorized by the manufacturer?

We Don't Sell Computers

We have good reason to hope you buy a computer. Every new owner represents a potential reader for *Creative Computing*, the number one magazine of applications and software. We give the beginner a wealth of useful articles, tutorials, games, and ideas for his computer. And when the beginner becomes an expert, we still have a lot to offer; in-depth articles on programming, reviews of the latest products, highlights of important events in computer community and much more.

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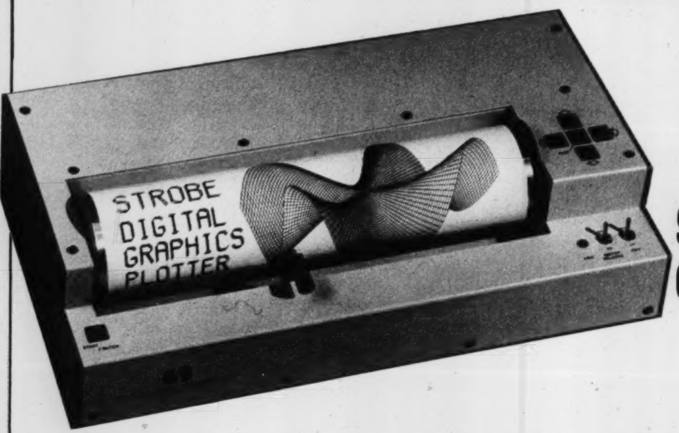

Strobe Model 100 Graphics Plotter

Glenn A. Hart

Most microcomputerists know that the old cliche "a picture is worth a thousand words" very much applies to them. Owners of TRS-80, PET, Apple, Atari and other micros enjoy the enhanced communicative power of programs rich in graphic images, and increasingly sophisticated graphics interfaces are becoming available for S-100 and other more powerful units.

Business and scientific users have long employed graphics for presentation of complex interrelationships and trends. Analytic insights which are hidden in dry tables of output often become immediately clear when displayed graphically.

The trend toward use of microcomputers as personal management tools has resulted in the recent release of many useful plotting and graphics programs. Often using the color graphics capabilities available with micros, these programs can be extremely valuable and productive.

A major drawback, however, is the video-oriented nature of graphic displays. Without some way to save the image produced, the graphic is transient and its utility to management is reduced by the inability to circulate the results.

Various methods are available to transfer the image to a permanent, hard copy form. One way is actually to photograph the screen. This often doesn't work too well for microcomputers, since taking an undistorted, correctly exposed photograph of a CRT display is complicated by scanning rates, low brightness of the CRT image, the need to focus closer than some lenses allow and with great accuracy, etc. While this is a viable method with special photographic equipment designed specifically for this purpose, the cost of such devices is out of the range of micro users.

Some printers have the ability to print dots under software control and can produce reasonable and sometimes impressive hard graphics. Most daisy wheel printers (Diablo/Xerox, Qume, NEC Spinwriter and others) include a graphics mode which can print up to 120 dots per inch horizontally and 60 dots per inch vertically. One excellent software package which allows such graphics with Diablo printers is Escape Plot from Escape, Ltd. in Atlanta (the subject of a future evolution). Unfortunately, this package is written in and requires knowledge of Fortran, but otherwise owners of Diablos will find it worth investigating.

Inclusion of dot raster graphics is increasing among dot matrix printers in a wide range of prices. Various printers from IDS (the Paper Tiger series), Epson, Malibu and many others will produce graphic images, but in general there is little software to handle the process. In addition, serious vertical registration problems caused by simple paper-handling mechanics often result in mediocre to poor results.

Enter The Plotter

A far better solution is a plotter designed specifically for the preparation of graphics. There are two main types of plotters. The flat bed design holds paper on a flat platform while a pen is moved about the paper surface in two dimensions to draw the image, much as a human hand would. Drum plotters wrap the paper around the cylinder which rotates to provide vertical positioning while a pen moves horizontally over the paper surface.

Plotters of both types are available for connection to microcomputers. Most use simple parallel interfaces, although there are also plotters with built-in microprocessors for "intelligent" plotting using serial RS-232 interfaces. In addition to the basic design and interface method, the other major points of differentiation among plotters are the size of the paper which can be accommodated (the two most common sizes are standard 8 1/2" x 11" and 11" x 17") and the resolution possible (usually measured in thousandths of an inch).

The most popular flat bed plotter for micros is the Hi-Plot series manufactured by Houston Instruments. Available in both standard sizes and with various interfacing options, these are fine units which offer reasonable resolution at moderate cost. Their widespread acceptance has resulted in the creation of fairly large body of applications software and a healthy users group.

The subject of this evaluation is a new drum plotter manufactured by Strobe, Inc. of Mountain View, CA. Their Model 1000 offers exceptional performance at a significant price savings over the ubiquitous Hi-Plot, but (as always) not without certain tradeoffs.

The Strobe handles standard 8 1/2" x 11" paper only. While there are drum plotters available which allow the use of larger paper, the normal typing paper size is more than adequate for most uses. Two 8-bit parallel output ports and one 8-bit parallel input port are required, and Strobe's documentation clearly shows how to wire the connection. Alternatively Strobe offers optional interfaces for the TRS-80, Apple II, PET and S-100 bus.

While my IMS 8000 system has 24-bits of unused parallel ports, I chose to purchase the S-100 interface card from Strobe to simplify installation. The interface card is only half populated to drive the plotter; an additional 8255 chip can be installed to add extra parallel ports to an S-100 system if desired. A normal ribbon cable runs from the interface to a special connector on the back of the plotter.

The Strobe uses several types of commercially available pens. Either the nylon-tip Pilot Razor Point or the Berol Spree ball point are recommended, since both have soft plastic shanks. The pen is screwed into a pen holder which cuts a thread into the shank. This requires a bit of pressure the first time, but thereafter

Glenn A. Hart, 51 Church Road, Monsey, NY 10952.

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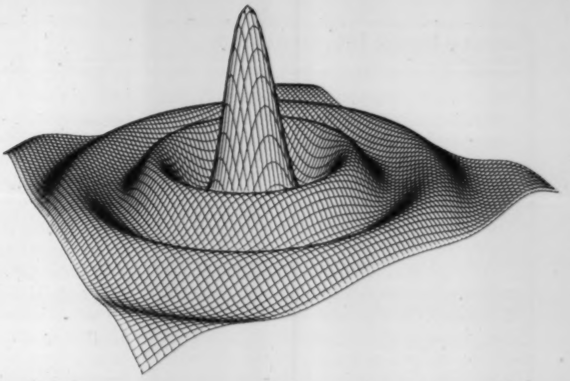

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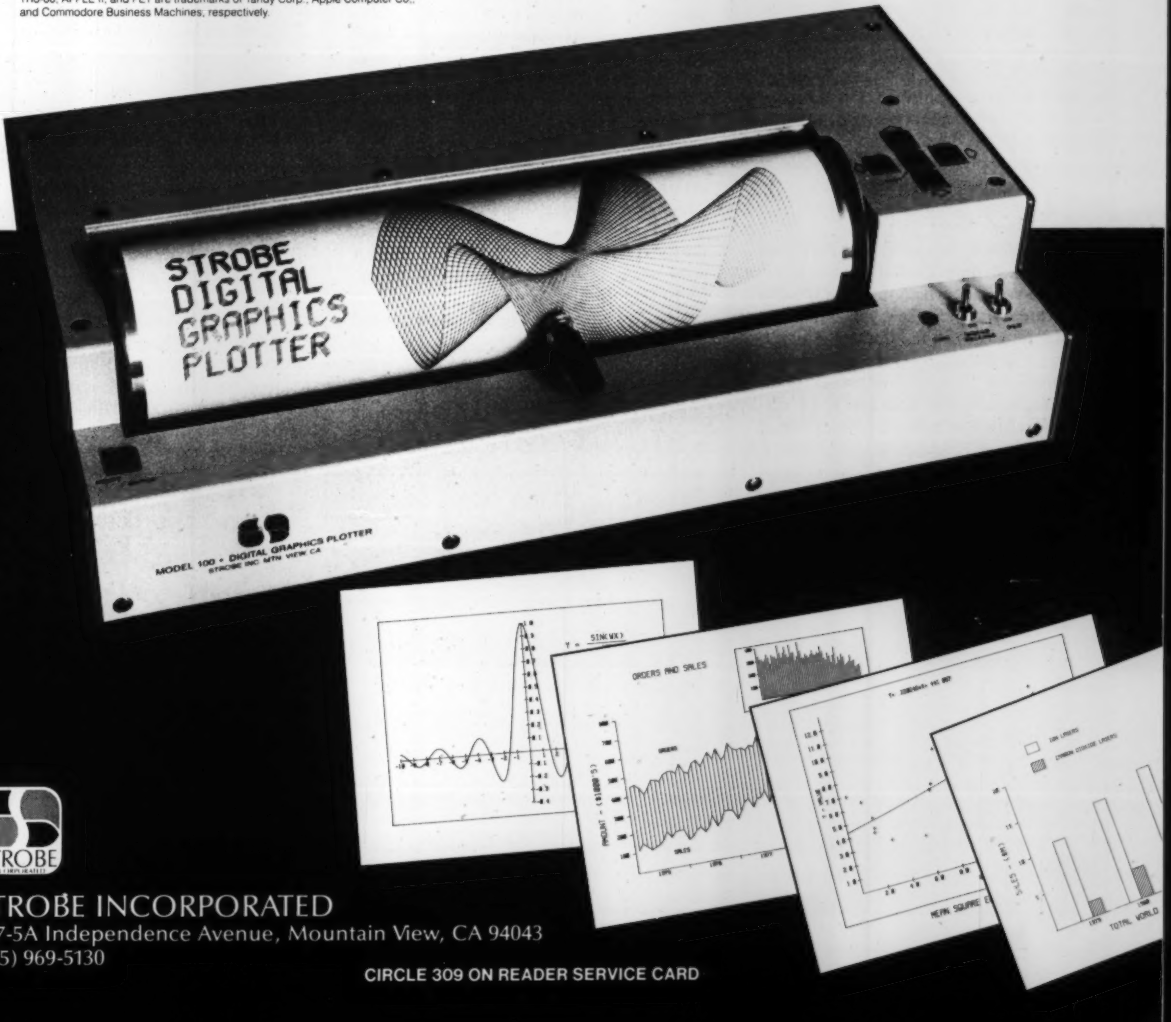
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inserting a pen takes only a second. The use of such common pens is a significant advantage over plotters which require custom pens, and since the recommended pens are available in a wide variety of colors, preparing multi-color graphics is easy.

Software

The plotter manual contains driver software in assembly language for the 8080, Z80 and 6502. The basic software performs two functions: one entry point allows setting the pen position with the hardware positioning controls on the plotter (an extra cost option on many other plotters) and the other entry point handles plotting vectors. Three parameters are passed to the vector routine, one each for the X and Y coordinates of the point to be plotted and one which tells the plotter whether the X, Y coordinates are relative to an origin (which can be reset to any location) or represent absolute motor steps. The driver software handles all motor control, necessary timing delays, etc.

By itself, this software can't do much. An experienced assembly language programmer could use this core to develop usable programs, but the relative beginner won't be able to generate anything meaningful. Strobe plans to issue a series of application programs using various host languages, including Microsoft's Fortran Compiler and Basic Interpreter and Compiler, CBasic, North Star Basic, and Basics for the TRS-80, Apple II and PET.

The first disk available is a general plotting package which includes the driver software modified by the addition of alphanumeric output routines which can draw characters in various sizes and orientations. The driver is further modifed to interface to the host language, in my case the Microsoft Basic Interpreter.

The driver program is a machine language executable file which is loaded into high memory prior to loading the Basic interpreter. It is provided in two versions for either 48K or 56K available memory. The Basic interpreter must then be loaded with its special /M: parameter to tell the interpreter the highest memory location to use so that the machine language driver is not overwritten by the interpreter.

Several programs and subroutines are supplied. The basic interface is through a set of subroutines called PSUBS, which handle passing variables between applications programs and the driver software, initializing the variables used by the driver, moving the pen, drawing characters, etc. The programs provided vary in their utility. Typer sends character strings to the plotter and is useful only as a demonstration (see Figure 1). The main event is a subroutine set named Draw8 and the Test8 program which shows how to use it.

The plotter writes quickly and quietly, and its positioning accuracy and reproducibility is superb.

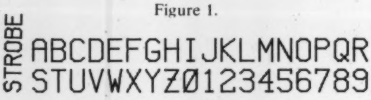
Draw8/Test8 is both powerful and useful. The basic purpose of the program is to draw line graphs of various types, including linear, semi-log and log-log scales. Any number of lines can be drawn, limited only by available memory. The program can be run completely automatically, with pre-supplied data and ranges and scales computed by the program; automatically but with specified ranges and scales; or interactively. In the interactive mode the program requests the data to be plotted in two basic ways, with the user providing all Y-coordinates and either all the X-coordinates as well or specifying a fixed increment for the X values.

The program prompts for min, max and increment values for each axis, whether tick marks on the axes or full grid lines should be used, how each line should be drawn (solid or dashed, with symbols at the points or not, just the points with no connecting line, etc.), which symbol to use (point, X, !, diamond, square, triangle, inverted triangle, diamond and +, square and X), graph orientation (regular with the X-axis on the long side or side reading with the X-axis on the short side of the paper), the type of scales (both linear, either or both log) and the titles for each axis and the overall graph.

This seems like a lot of prompting, but the interactive dialog is well done and the program is easy to use. Full source is provided so user modifications are simple. I have added the ability to read data from disk files and provisions for changing pens at appropriate times during the plotting process for multiple color graphs, and other enhancements should not be difficult to implement.

When the program is run the user is prompted for the necessary information if interactive mode has been specified. After all data have been entered (or immediately if data have been predefined), the user is prompted to move the pen to the desired origin with the movement switches and hit the "START" button. From then on operation is fully automatic.

Figure 1.



STROBE

ABCDEFGHIJKLMNOPQR
STUVWXYZ0123456789

Figure 2.

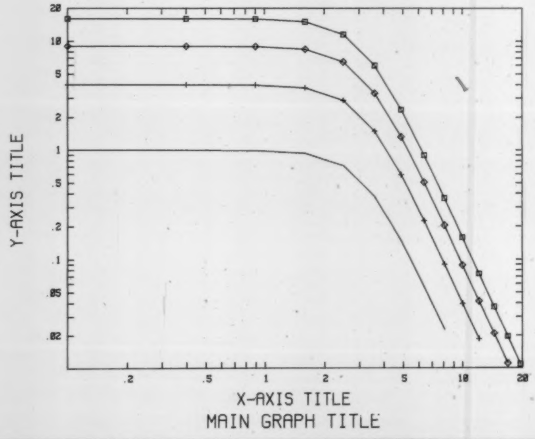
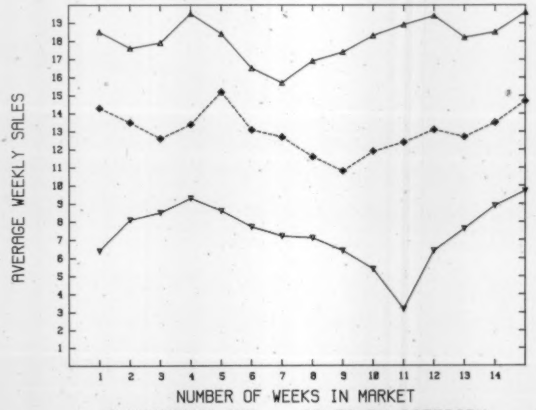


Figure 3.



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P.S. We're so confident of the quality of these programs that the documentation contains the programmer's home phone number!

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This disk contains a new BEXEC* that boots up with a numbered directory and which allows creation, deletion and renaming of files without calling other programs. It also contains a slight modification to BASIC to allow 14 character file names.

The disk contains a disk manager that contains a disk packer, a hex/dec calculator and several other utilities.

It also has a full screen editor (in machine code on C2P/C4)) that makes corrections a snap. We'll also toss in renumbering and program search programs — and sell the whole thing for —
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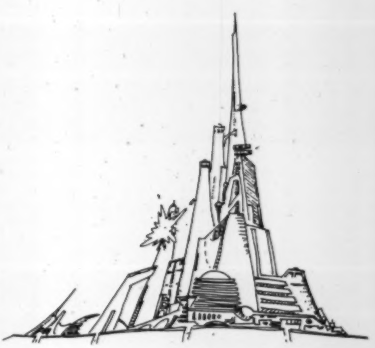

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GAMES FOR ALL SYSTEMS

GALAXIAN - 4K - One of the fastest and finest arcade games ever written for the OSI, this one features rows of hard-hitting evasive dogfighting aliens thirsty for your blood. For those who loved (and tired of) Alien Invaders. Specify system — A bargain at $9.95

MINOS - 8K - — Features amazing 3D graphics. You see a maze from the top, the screen blanks, and when it clears, you are in the maze at ground level finding your way through on foot. Realistic enough to cause claustrophobia. — $12.95

NEW — NEW — NEW

LABYRINTH - 8K - This has a display background similar to MINOS as the action takes place in a realistic maze seen from ground level. This is, however, a real time monster hunt as you track down and shoot mobile monsters on foot. Checking out and testing this one was the most fun I've had in years! — $13.95.

TIME TREK - 8K - Real Time and Real graphics Trek. See your torpedoes hit and watch your instruments work in real time. No more unrealistic scrolling displays! — $9.95

SUPPORT ROMS FOR BASIC IN ROM MACHINES — C1S/C2S. This ROM adds line edit functions, software selectable scroll windows, bell support, choice of OSI or standard keyboard routines, two callable screen clears, and software support for 32-64 characters per line video. Has one character command to switch model 2 C1P from 24 to 48 character line. When installed in C2 or C4 (C2S) requires installation of additional chip. C1P requires only a jumper change. — $39.95
C1E/C2E similar to above but with extended machine code monitor. — $59.95

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This is only a partial listing of what we have to offer. We now offer over 100 programs, data sheets, ROMS, and boards for OSI systems. Our $1.00 catalog lists it all and contains free program listings and programming hints to boot.

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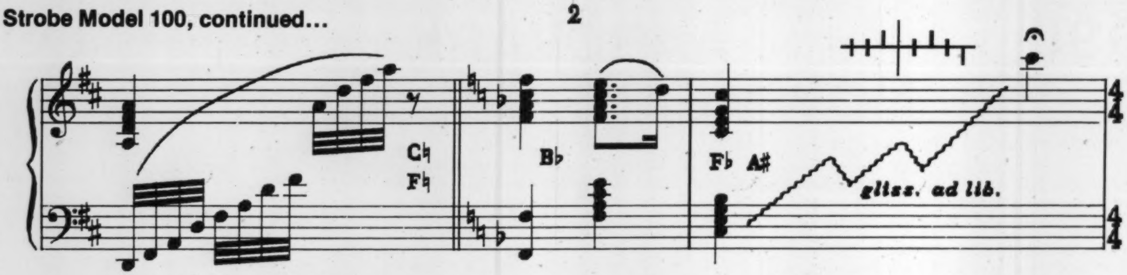
Strobe Model 100, continued...



A bar of music plotted on the Strobe 100 using routines developed by Leland C. Smith, Professor of Music, Stanford University, Stanford, CA 94305.

Plotting Quality

How does it work? Beautifully! Both engineering and business graphs (see Figures 2 and 3) are precise and well laid out. The resolution is excellent, with step increments barely visible on most lines. The program automatically positions titles along the axes and even the character set is better than most plotters provide. The plotter writes quickly and quietly, and its positioning accuracy and reproducibility is superb (even plotting the same line several times results in *one* line; there is no discernible error at all in the movement of the pen or the drum).

The overall plotting quality is distinctly better than that provided by the flat bed plotters I have seen, and is even superior to that of mainframe drum plotters costing tens of thousands of dollars. Some might consider the paper size a limitation, but I have used enlargements of the graphs produced in many business presentations to good effect. The interface and the plotter itself worked perfectly the first time I plugged them into my system and the software does everything claimed.

My only reservation is the limited software available. I am not familiar with the operation of other plotters and am not capable of translating any of their software to the Strobe's requirements. While I am getting better at writing my own programs to produce specialized graphs, I could really use histogram routines, pie chart graphing and other business applications and would love to be able to produce some attractive but frivolous images as well.

Considering the extremely high performance of the Model 100 and its attractive price (the plotter lists for $785 and interfaces range from $85 to $145), the Strobe plotter can be highly recommended to those capable of writing software to take full advantage of its capabilities. I hope that as more units reach the field a user's group will be established to exchange software and also that Strobe, Inc. itself will make much more applications software available. The Model 100 hardware is so good that it deserves nothing less. ☐

Interview with Robert Myers

Spotlight on Strobe

David H. Ahl

D.A.: I am interested in your small, inexpensive plotter. What is the market that you see for it?

R.M.: So far it has been pretty much in professional areas such as industry and laboratories. There is also a very large educational market in universities and high schools. Also we are hoping to penetrate the OEM market. One obvious use we see is as an adjunct to a word processing system. A high quality graphics plotter, especially one low in cost, can be used as an accessory for statistical, financial, business, scientific reports, and the like.

D.A.: What kind of software do you have now and do you intend to provide?

R.M.: We have a general purpose graphing pack which does linear, semi-log, and log-log plots. It it is menu driven and has options for automatic scaling. It does various plot symbols and different kinds of lines, automatic centering, labels for the X axis, and title. Also in that package are parameters for doing vector plotting, alphanumeric screen applications, and cursor controls to position the point of your input data.

Robert E. Myers, President of Strobe.

D.A.: For what computers is the software available?

R.M.: The software is available for Applesoft Basic, TRS-80 Basic, Microsoft Basic, CBasic, Microsoft Fortran, and some others. We have a business package in preparation which, among other things, will do bar graphs, pie charts, etc. Also we have a 3-D hidden line plotting package. Those are a start. We noticed much interest at the show (West Coast Computer Faire) in architectural applications.

D.A.: How long has Strobe been in business?

R.M.: It started about three years ago and has been a full-time project for the past two years.

D.A.: Is the current plotter that you have your first product?

R.M.: Yes, it was introduced at the 1980 West Coast Computer Faire.

D.A.: Are most of your sales now through dealers?

R.M.: Through dealers and direct. We are also seeking distributors and in the process of negotiating with potential distributors in France and the United Kingdom. The market looks pretty rosy; but it's a new market, and one in which we have to educate people in the use of hard copy graphics.

> *"We find Pilot razor point pens better than most commercial plotter pens."*

D.A.: What do you see as the impact of some of the new line printers with graphics capabilities?

R.M.: With many of them it is equivalent to the difference between using a dot matrix printer for word processing versus using a Qume or Hytype. Both have their advantages: with one you have low cost printing but you don't have letter quality output. Similarly in plotting, if you want quality you are faced with the same problems. Ours has over 2500 points resolution in the x direction. It is considerably ahead of most of the current state-of-the-art low-cost dot matrix printers.

D.A.: Why did you go with the drum technology?

R.M.: It's a very simple mechanism: very reliable, a small package, good type, etc.

D.A.: Does it require any special pens or paper?

R.M.: It will use any paper, 8-1/2 x 11 inches or smaller. The paper is held down mechanically by a spring. It uses Pilot razor-point pens, among others, which are very easy to find and a much higher quality than many commercial plotter pens. Also they last longer.

D.A.: If you stop to change pens while you are doing plotting routines presumably you can get multiple color plots.

R.M.: Yes, you saw some examples at the show. Essentially that involves pausing and changing pens. The pause can be arranged as a program stop, in Basic a symbol. We call it semi-automatic.

D.A.: With respect to the interface to an Apple or TRS-80, is it through an RS-232 port or do you have a card for each machine or what?

R.M.: There are two different approaches. We provide cards that provide a parallel I/O for the Apple, TRS-80, Pet and S100 family. We also have a prototype RS-232 intelligent version (Model 110) that can interface to any computer.

For more information, contact Strobe Inc., 847 Independence Ave., Bldg. 5A, Mountain View, CA 94042. (415) 969-5130. ☐

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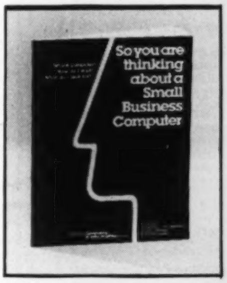

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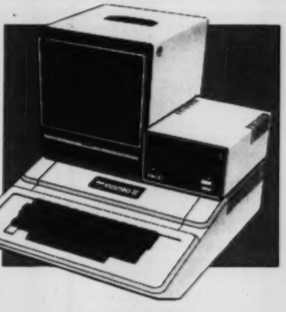

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CARD GAMES

BRIDGE 2.0 (Available for all computers) **Price: $17.95 Cassette/$21.95 Diskette**
An all-inclusive version of this most popular of card games. This program both BIDS and PLAYS either contract or duplicate bridge. Depending on the contract, your computer opponents will either play the offense OR defense. If you bid too high, the computer will double your contract! BRIDGE 2.0 provides challenging entertainment for advanced players and is an excellent learning tool for the bridge novice. See the software review in 80 Software Critique.

HEARTS 1.5 (Available for all computers) **Price: $15.95 Cassette/$19.95 Diskette**
An exciting and entertaining computer version of this popular card game. Hearts is a trick-oriented game in which the purpose is not to take any hearts or the queen of spades. Play against two computer opponents who are armed with hard-to-beat playing strategies. HEARTS 1.5 is an ideal game for introducing the uninitiated (your spouse) to computers. See the software review in 80 Software Critique.

STUD POKER (Atari only) **Price: $11.95 Cassette/$15.95 Diskette**
This is the classic gambler's card game. The computer deals the cards one at a time and you (and the computer) bet on what you see. The computer does not cheat and *usually* bets the odds. However, it sometimes bluffs! Also included is a five card draw poker betting practice program. This package will run on a 16K ATARI. Color, graphics, sound.

POKER PARTY (Available for all computers) **Price: $17.95 Cassette/$21.95 Diskette**
POKER PARTY is a draw poker simulation based on the book, POKER, by Oswald Jacoby. This is the most comprehensive version available for microcomputers. The party consists of yourself and six other (computer) players. Each of these players (you will get to know them) has a different personality in the form of a varying propensity to bluff or fold under pressure. Practice with POKER PARTY before going to that expensive game tonight! Apple Cassette and diskette versions require a 32 K (or larger) Apple II.

CRIBBAGE 2.0 (TRS-80 only) **Price: $14.95 Cassette/$18.95 Diskette**
This is simply the best cribbage game available. It is an excellent program for the cribbage player in search of a worthy opponent as well as for the novice wishing to improve his game. The graphics are superb and assembly language routines provide rapid execution. See the software review in 80 Software Critique.

THOUGHT PROVOKERS

MANAGEMENT SIMULATOR (Atari, North Star and CP/M only) **Price: $19.95 Cassette**
$23.95 Diskette
This program is both an excellent teaching tool as well as a stimulating intellectual game. Based upon similar games played at graduate business schools, each player or team controls a company which manufacturers three products. Each player attempts to outperform his competitors by setting selling prices, production volumes, marketing and design expenditures etc. The most successful firm is the one with the highest stock price when the simulation ends.

FLIGHT SIMULATOR (Available for all computers) **Price: $17.95 Cassette/$21.95 Diskette**
A realistic and extensive mathematical simulation of take-off, flight and landing. The program utilizes aerodynamic equations and the characteristics of a real airfoil. You can practice instrument approaches and navigation using radials and compass headings. The more advanced flyer can also perform loops, half-rolls and similar aerobatic maneuvers. Although this program does not employ graphics, it is exciting and very addictive. See the software review in COMPUTRONICS.

VALDEZ (Available for all computers) **Price: $15.95 Cassette/$19.95 Diskette**
VALDEZ is a computer simulation of supertanker navigation in the Prince William Sound/Valdez Narrows region of Alaska. Included in this simulation is a realistic and extensive 256 × 256 element map, portions of which may be viewed using the ship's alphanumeric radar display. The motion of the ship itself is accurately modelled mathematically. The simulation also contains a model for the tidal patterns in the region, as well as other traffic (outgoing tankers and drifting icebergs). Chart your course from the Gulf of Alaska to Valdez Harbor! See the software review in 80 Software Critique.

BACKGAMMON 2.0 (Atari, North Star and CP/M only) **Price: $14.95 Cassette/$18.95 Diskette**
This program tests your backgammon skills and will also improve your game. A human can compete against a computer or against another human. The computer can even play itself. Either the human or the computer can double or generate dice rolls. Board positions can be created or saved for replay. BACKGAMMON 2.0 is played in accordance with the official rules of backgammon and is sure to provide many fascinating sessions of backgammon play.

CHECKERS 3.0 (PET only) **Price: $16.95 Cassette/$20.95 Diskette**
This is one of the most challenging checkers programs available. It has 10 levels of play and allows the user to change skill levels at any time. Though providing a very tough game at level 4-8, CHECKERS 3.0 is practically unbeatable at levels 9 and 10.

CHESS MASTER (North Star and TRS-80 only) **Price: $19.95 Cassette/$23.95 Diskette**
This complete and very powerful program provides five levels of play. It includes castling, en passant captures and the promotion of pawns. Additionally, the board may be preset before the start of play, permitting the examination of "book" plays. To maximize execution speed, the program is written in assembly language (by SOFTWARE SPECIALISTS of California). Full graphics are employed in the TRS-80 version, and two widths of alphanumeric display are provided to accommodate North Star users.

NOMINOES JIGSAW (Atari, Apple and TRS-80 only) **Price: $16.95 Cassette/$20.95 Diskette**
A jigsaw puzzle on your computer! Complete the puzzle by selecting your pieces from a table consisting of 60 different shapes. NOMINOES JIGSAW is a virtuoso programming effort. The graphics are superlative and the puzzle will challenge you with its three levels of difficulty. Scoring is based upon the number of guesses taken and by the difficulty of the board set-up.

MONARCH (Atari only) **Price: $11.95 Cassette/$15.95 Diskette**
MONARCH is a fascinating economic simulation requiring you to survive an 8-year term as your nation's leader. You determine the amount of acreage devoted to industrial and agricultural use, how much food to distribute to the populace and how much should be spent on pollution control. You will find that all decisions involve a compromise and that it is not easy to make everyone happy.

CHOMP-OTHELLO (Atari only) **Price: $11.95 Cassette/$15.95 Diskette**
CHOMP-OTHELLO? It's really two challenging games in one. CHOMP is similar in concept to NIM; you must bite off part of a cookie, but avoid taking the poisoned portion. OTHELLO is the popular board game set to fully utilize the Atari's graphics capability. It is also very hard to beat! This package will run on a 16K system.

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STARTREK 3.2 (Available for all computers) **Price: $11.95 Cassette/$15.95 Diskette**
This is the classic Startrek simulation, but with several new features. For example, the Klingons now shoot at the Enterprise without warning while also attacking starbases in other quadrants. The Klingons also attack with both light and heavy cruisers and move when shot at! The situation is hectic when the Enterprise is besieged by three heavy cruisers and a starbase S.O.S. is received! The Klingons get even! See the software reviews in A.N.A.L.O.G., 80 Software Critique and Game Merchandising.

BLACK HOLE (Apple only) **Price: $14.95 Cassette/$18.95 Diskette**
This is an exciting graphical simulation of the problems involved in closely observing a black hole with a space probe. The object is to enter and maintain, for a prescribed time, an orbit close to a small black hole. This is to be achieved without coming so near the anomaly that the tidal stress destroys the probe. Control of the craft is realistically simulated using side jets for rotation and main thrusters for acceleration. This program employs Hi-Res graphics and is educational as well as challenging.

SPACE TILT (Apple and Atari only) **Price: $10.95 Cassette/$14.95 Diskette**
Use the game paddles to tilt the plane of the TV screen to "roll" a ball into a hole in the screen. Sound simple? Not when the hole gets smaller and smaller! A built-in timer allows you to measure your skill against others in this habit-forming action game.

MOVING MAZE (Apple only) **Price: $10.95 Cassette/$14.95 Diskette**
MOVING MAZE employs the games paddles to direct a puck from one side of a maze to the other. However, the maze is dynamically (and randomly) built and is continually being modified. The objective is to cross the maze without touching (or being hit by) a wall. Scoring is by an elapsed time indicator, and three levels of play are provided.

ALPHA FIGHTER (Atari only) **Price: $14.95 Cassette/$18.95 Diskette**
Two excellent graphics and action programs in one! ALPHA FIGHTER requires you to destroy the alien starships passing through your sector of the galaxy. ALPHA BASE is in the path of an alien UFO invasion; let five UFO's get by and the game ends. Both games require the joystick and get progressively more difficult the higher you score! ALPHA FIGHTER will run on 16K systems.

INTRUDER ALERT (Atari only) **Price: $16.95 Cassette/$20.95 Diskette**
This is a fast paced graphics game which places you in the middle of the "Dreadstar" having just stolen its plans. The droids have been alerted and are directed to destroy you at all costs. You must find and enter your ship to escape with the plans. Five levels of difficulty are provided. INTRUDER ALERT requires a joystick and will run on 16K systems.

GIANT SLALOM (Atari only) **Price: $14.95 Cassette/$18.95 Diskette**
This real-time action game is guaranteed addictive! Use the joystick to control your path through slalom courses consisting of both open and closed gates. Choose from different levels of difficulty, race against other players or simply take practice runs against the clock. GIANT SLALOM will run on 16K systems.

TRIPLE BLOCKADE (Atari only) **Price: $14.95 Cassette/$18.95 Diskette**
TRIPLE BLOCKADE is a two-to-three player graphics and sound action game. It is based on the classic video arcade game which millions have enjoyed. Using the Atari joysticks, the object is to direct your blockading line around the screen without running into your opponent(s). Although the concept is simple, the combined graphics and sound effect lead to "high anxiety".

GAMES PACK I (Available for all computers) **Price: $10.95 Cassette/$14.95 Diskette**
GAMES PACK I contains the classic computer games of BLACKJACK, LUNAR LANDER, CRAPS, HORSERACE, SWITCH and more. These games have been combined into one large program for ease in loading. They are individually accessed by a convenient menu. This collection is worth the price just for the DYNACOMP version of BLACKJACK.

GAMES PACK II (Available for all computers) **Price: $10.95 Cassette/$14.95 Diskette**
GAMES PACK II includes the games CRAZY EIGHTS, JOTTO, ACEY-DUCEY, LIFE, WUMPUS and others. As with GAMES PACK I, all the games are loaded as one program and are called from a menu. You will particularly enjoy DYNACOMP's version of CRAZY EIGHTS.

Why pay $7.95 or more per program when you can buy a DYNACOMP collection for just $10.95?

MOON PROBE (Atari only) **Price: $11.95 Cassette/$15.95 Diskette**
This is an extremely challenging "lunar lander" program. The user must drop from orbit to land at a predetermined target on the moon's surface. You control the thrust and orientation of your craft plus direct the rate of descent and approach angle.

ADVENTURE

CRANSTON MANOR ADVENTURE (North Star and CP/M only) **Price: $21.95 Diskette**
At last! A comprehensive Adventure game for North Star and CP/M systems. CRANSTON MANOR ADVENTURE takes you into mysterious CRANSTON MANOR where you attempt to gather fabulous treasures. Lurking in the manor are wild animals and robots who will not give up the treasures without a fight. The number of rooms is greater and the associated descriptions are much more elaborate than the current popular series of Adventure programs, making this game the top in its class. Play can be stopped at any time and the status stored on diskette.

ABOUT DYNACOMP

DYNACOMP is a leading distributor of small system software with sales spanning the world (currently in excess of 40 countries). During the past two years we have greatly enlarged the DYNACOMP product line, but have maintained and improved our high level of quality and customer support. The achievement in quality is apparent from our many repeat customers and the software reviews in such publications as COMPUTRONICS, 80 Software Critique and A.N.A.L.O.G. Our customer support is as close as your phone. It is always friendly. The staff is highly trained and always willing to discuss products or give advice.

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BUSINESS and UTILITIES

SPELLGUARD™ (CP/M only) **Price: $269.95 Disk**
SPELLGUARD is a revolutionary new product which increases the value of your current word processing system (WORDSTAR, MAGIC WAND, ELECTRIC PENCIL, TEXTED EDITOR II and others). Written entirely in assembly language, SPELLGUARD™ rapidly assists the user in eliminating spelling and typographical errors by comparing each word of the text against a dictionary (expandable) of over 20,000 of the most common English words. Words appearing in the text but not found in the dictionary are "flagged" for easy identification and correction. Most administrative staff familiar with word processing equipment will be able to use SPELLGUARD™ in only a few minutes.

MAIL LIST 2.2 (Apple, Atari and North Star diskette only) **Price: $34.95**
This program is unmatched in its ability to store a maximum number of addresses on one diskette (minimum of 1100 per diskette, more than 2200 for "double density" systems!). Its many features include alphabetic and zip code sorting, label printing, merging of files and a unique keyword seeking routine which retrieves entries by a virtually limitless selection of user defined codes. Mail List 2.2 will even find and delete duplicate entries. A very valuable program!

FORM LETTER SYSTEM (FLS) (Apple and North Star diskette only) **Price: $21.95**
Use FLS to create and edit form letters and address lists. Form letters are produced by automatically inserting each address into a predetermined portion of your letter. FLS is completely compatible with MAIL LIST 2.2, which may be used to manage your address files.

FLS and MAIL LIST 2.2 are available as a combined package for $49.95.

SORTIT (North Star only) **Price: $29.95 Diskette**
SORTIT is a general purpose sort program written in 8080 assembly language. This program will sort sequential data files generated by NORTH STAR BASIC. Primary and optional secondary keys may be numeric or one to nine character strings. SORTIT is easily used with files generated by DYNACOMP's MAIL LIST program and is very versatile in its capabilities for all other BASIC data file sorting.

PERSONAL FINANCE SYSTEM (Atari and North Star only) **Price: $34.95 Diskette**
PFS is a single diskette, menu-oriented system composed of ten different programs. Besides recording your expenses and tax deductible items, PFS will sort and summarize expenses by payee, and display information on expenditures by any of 26 user defined codes by month or by payee. PFS will even produce monthly bar graphs of your expenses by category! This powerful package requires only one disk drive, minimal memory (24K Atari, 32K North Star) and will store up to 600 records per disk (and over 1000 records per disk by making a few simple changes to the programs). You can record checks plus cash expenses so that you can finally see where your money goes and eliminate guesswork and tedious hand calculations.

FAMILY BUDGET (Apple only) **Price: $34.95 Diskette**
The FAMILY BUDGET is a very convenient financial record-keeping program. You will be able to keep track of cash and credit expenditures as well as income on a daily basis. You can record tax deductible items and charitable donations. The FAMILY BUDGET also provides a continuous record of all credit transactions. You can make daily cash and charge entries to any of 21 different expense accounts as well as to 5 payroll and tax accounts. Data is easily retrieved giving the user complete control over an otherwise complicated (and unorganized!) subject.

THE COMMUNICATOR (Atari only) **Price: $49.95 Diskette**
This software package contains a menu-driven collection of programs for facilitating efficient two-way communications through a full duplex modem (required for use). In one mode of operation you may connect to a data service (e.g., The SOURCE or MicroNet) and quickly load data such as stock quotations onto your diskette for later viewing. This greatly reduces "connect time" and thus the service charge. You may also record the complete contents of a communications session. Additionally, programs written in BASIC, FORTRAN, etc. may be built off-line using the support text editor and later "uploaded" to another computer, making the Atari a *very* smart terminal. Even Atari BASIC programs may be uploaded. Further, a command file may be built off-line and used later as controlling input for a time-share system. That is, you can set up your sequence of time-share commands and programs, and the Atari will transmit them as needed; batch processing. All this adds up to saving both connect time and your time.

DYNACOMP also supplies THE COMMUNICATOR with an Atari 830 modem for a combined price of $219.95. The modem is available separately for $189.95.

TEXT EDITOR II (CP/M) **Price: $29.95 Diskette/$33.45 Disk**
This is the second release version of DYNACOMP's popular TEXT EDITOR I and contains many new features. With TEXT EDITOR II you may build text files in chunks and assemble them for later display. Blocks of text may be appended, inserted or deleted. Files may be saved on disk/diskette in right justified/centered format to be later printed by either TEXT EDITOR II or the CP/M ED facility. Futher, ASCII CP/M files (including BASIC and assembly language programs) may be read by the editor and processed. In fact, text files can be built using ED and later formatted using TEXT EDITOR II. All in all, TEXT EDITOR II is an inexpensive, easy to use, but very flexible editing system.

DFILE (North Star only) **Price: $19.95**
This handy program allows North Star users to maintain a specialized data base of all files and programs in the stack of disks which invariably accumulates. DFILE is easy to set up and use. It will organize your disks to provide efficient locating of the desired file or program.

FINDIT (North Star only) **Price: $19.95**
This is a three-in-one program which maintains information accessible by keywords of three types: Personal (eg: last name), Commercial (eg: plumbers) and Reference (eg: magazine articles, record albums, etc). In addition to keyword searches, there are birthday, anniversary and appointment searches for the personal records and appointment searches for the commercial records. Reference records are accessed by a single keyword or by cross-referencing two or three keywords.

GRAFIX (TRS-80 only) **Price: $14.95 Cassette/$18.95 Diskette**
This unique program allows you to easily create graphics directly from the keyboard. You "draw" your figure using the program's extensive cursor controls. Once the figure is made, it is automatically appended to your BASIC program as a string variable. Draw a "happy face", call it H$ and then print it from your program using PRINT H$! This is a very easy way to create and save graphics.

EDUCATION

HODGE PODGE (Apple only, 48K Applesoft or Integer BASIC) **Price: $19.95 Cassette/$23.95 Diskette**
Let HODGE PODGE be your child's baby sitter. Pressing any key on your Apple will result in a different and intriguing "happening" related to the letter or number of the chosen key. The program's graphics, color and sound are a delight for children from ages 1½ to 9. HODGE PODGE is a non-intimidating teaching device which brings a new dimension to the use of computers in education.

TEACHER'S PET I (Available for all computers) **Price: $11.95 Cassette/$15.95 Diskette**
This is the first of DYNACOMP's educational packages. Primarily intended for pre-school to grade 3, TEACHER'S PET provides the young student with counting practice, letter-word recognition and three levels of math skill exercises.

MORSE CODE TRAINER (TRS-80 only) **Price: $12.95 Cassette/$16.95 Diskette**
MORSE CODE TRAINER is designed to develop and improve your speed and accuracy in deciphering Morse Code. As such, MCT is an ideal software package for FCC test practice. The code sound is obtained through the earphone jack of any standard cassette recorder. You may choose the pitch of the tones as well as the word rate. Also, various modes of operation are available including number, punctuation and alphabet tests, as well as the keying of your own message. A very effective way to learn code!

MISCELLANEOUS

CRYSTALS (Atari only) **Price: $ 9.95 Cassette/$13.95 Diskette**
A unique algorithm randomly produces fascinating graphics displays accompanied with tones which vary as the patterns are built. No two patterns are the same, and the combined effect of the sound and graphics are mesmerizing. CRYSTALS has been used in local stores to demonstrate the sound and color features of the Atari.

NORTH STAR SOFTWARE EXCHANGE (NSSE) LIBRARY
DYNACOMP now distributes the 23 volume NSSE library. These diskettes each contain many programs and offer an outstanding value for the purchase price. They should be part of every North Star user's collection. Call or write DYNACOMP for details regarding the contents of the NSSE collection.

Price: $9.95 each/$7.95 each (4 or more)
The complete collection may be purchased for $149.95

AVAILABILITY

DYNACOMP software is supplied with complete documentation containing clear explanations and examples. Unless otherwise specified, all programs will run within 16K program memory space (ATARI requires 24K). Except where noted, programs are available on ATARI, PET, TRS-80 (Level II) and Apple (Applesoft) cassette and diskette as well as North Star single density (double density compatible) diskette. Additionally, most programs can be obtained on standard (IBM format) 8" CP/M floppy disks for systems running under MBASIC.

STATISTICS and ENGINEERING

DIGITAL FILTER (Available for all computers) **Price: $29.95 Cassette/$33.95 Diskette**
DIGITAL FILTER is a comprehensive data processing program which permits the user to design his own filter function or choose from a menu of filter forms. The filter forms are subsequently converted into non-recursive convolution coefficients which permit rapid data processing. In the explicit design mode the shape of the frequency transfer function is specified by directly entering points along the desired filter curve. In the menu mode, ideal low pass, high pass and bandpass filters may be approximated to varying degrees according to the number of points used in the calculation. These filters may optionally also be smoothed with a Hanning function. In addition, multi-stage Butterworth filters may be selected. Features of DIGITAL FILTER include plotting of the data before and after filtering, as well as display of the chosen filter functions. Also included are convenient data storage, retrieval and editing procedures.

DATA SMOOTHER (Not available for Atari) **Price: $14.95 Cassette/$18.95 Diskette**
This special data smoothing program may be used to rapidly derive useful information from noisy business and engineering data which are equally spaced. The software features choice in degree and range of fit, as well as smoothed first and second derivative calculation. Also included is automatic plotting of the input data and smoothed results.

FOURIER ANALYZER (Available for all computers) **Price: $16.95 Cassette/$20.95 Diskette**
Use this program to examine the frequency spectra of limited duration signals. The program features automatic scaling and plotting of the input data and results. Practical applications include the analysis of complicated patterns in such fields as electronics, communications and business.

TFA (Transfer Function Analyzer) **Price: $19.95 Cassette/$23.95 Diskette**
This is a special software package which may be used to evaluate the transfer functions of systems such as hi-fi amplifiers and filters by examining their response to pulsed inputs. TFA is a major modification of FOURIER ANALYZER and contains an engineering-oriented decibel versus log-frequency plot as well as data editing features. Whereas FOURIER ANALYZER is designed for educational and scientific use, TFA is an engineering tool. Available for all computers.

HARMONIC ANALYZER (Available for all computers) **Price: $24.95 Cassette/$28.95 Diskette**
HARMONIC ANALYZER was designed for the spectrum analysis of repetitive waveforms. Features include data file generation, editing and storage/retrieval as well as data and spectrum plotting. One particularly unique facility is that the input data need not be equally spaced or in order. The original data is sorted and a cubic spline interpolation is used to create the data file required by the FFT algorithm.

FOURIER ANALYZER, TFA and HARMONIC ANALYZER may be purchased together for a combined price of $49.95 (three cassettes) and $59.95 (three diskettes).

REGRESSION I (Available for all computers) **Price: $19.95 Cassette/$23.95 Diskette**
REGRESSION I is a unique and exceptionally versatile one-dimensional least squares "polynomial" curve fitting program. Features include very high accuracy; an automatic degree determination option; an extensive internal library of fitting functions; data editing; automatic data and curve plotting; a statistical analysis (eg: standard deviation, correlation coefficient, etc.) and much more. In addition, new fits may be tried without reentering the data. REGRESSION I is certainly the cornerstone program in any data analysis software library.

REGRESSION II (PARAFIT) (Available for all computers) **Price: $19.95 Cassette/$23.95 Diskette**
PARAFIT is designed to handle those cases in which the parameters are imbedded (possibly nonlinearly) in the fitting function. The user simply inserts the functional form, including the parameters (A(1), A(2), etc.) as one or more BASIC statement lines. Data and results may be manipulated and plotted as with REGRESSION I. Use REGRESSION I for polynomial fitting, and PARAFIT for those complicated functions.

MULTILINEAR REGRESSION (MLR) (Available for all computers) **Price: $24.95 Cassette/$28.95 Diskette**
MLR is a professional software package for analyzing data sets containing two or more linearly independent variables. Besides performing the basic regression calculation, this program also provides easy to use data entry, storage, retrieval and editing functions. In addition, the user may interrogate the solution by supplying values for the independent variables. The number of variables and data size is limited only by the available memory.

REGRESSION I, II and MULTILINEAR REGRESSION may be purchased together for $51.95 (three cassettes) or $63.95 (three diskettes).

ANOVA (Available for all computers) **Price: $39.95 Cassette/$43.95 Diskette**
In the past the ANOVA (analysis of variance) procedure has been limited to the large mainframe computers. Now DYNACOMP has brought the power of this method to small systems. For those conversant with ANOVA, the DYNACOMP software package includes the 1-way, 2-way and N-way procedures. Also provided are the Yates 2^{K-P} factorial designs. For those unfamiliar with ANOVA, do not worry. The accompanying documentation was written in a tutorial fashion (by a professor in the subject) and serves as an excellent introduction to the subject. Accompanying ANOVA is a support program for building the data base. Included are several convenient features including data editing, deleting and appending.

BASIC SCIENTIFIC SUBROUTINES, Volume I (Not available for Atari)
DYNACOMP is the exclusive distributor for the software keyed to the popular text *BASIC Scientific Subroutines, Volume I* by F. Ruckdeschel (see the BYTE/McGraw-Hill advertisement in BYTE magazine, January 1981). These subroutines have been assembled according to chapter. Included with each collection is a menu program which selects and demonstrates each subroutine.

Collection #1:	Chapters 2 and 3:	Data and function plotting, complex variables
Collection #2:	Chapter 4:	Matrix and vector operations
Collection #3:	Chapters 5 and 6:	Random number generators, series approximations

Price per collection: $14.95 Cassette/$18.95 Diskette
All three collections are available for $39.95 (three cassettes) and $49.95 (three diskettes).
Because the text is a vital part of the documentation, *BASIC Scientific Subroutines, Volume I* is available from DYNACOMP for $19.95 plus 75¢ postage and handling.

ROOTS (Available for all computers) **Price $10.95 Cassette/$14.95 Diskette**
In a nutshell, ROOTS simultaneously determines all the zeroes of a polynomial having real coefficients. There is no limit on the degree of the polynomial, and because the procedure is iterative, the accuracy is generally very good. No initial guesses are required as input, and the calculated roots are substituted back into the polynomial and the residuals displayed.

ACTIVE CIRCUIT ANALYSIS (ACAP) (48K Apple only) **Price: $25.95/$29.95 Diskette**
ACAP is the analog circuit designer's answer to LOGIC SIMULATOR. With ACAP you may analyze the response of an active or passive component circuit (e.g., a transistor amplifier, band pass filter, etc.). The circuit may be probed at equal steps in frequency, and the resulting complex (*i.e.*, real and imaginary) voltages at each component juncture examined. By plotting the magnitude of these voltages, the frequency response of a filter or amplifier may be completely determined with respect to both amplitude and phase. In addition, ACAP prints a statistical analysis of the range of voltage responses which result from tolerance variations in the components.

ACAP is easy to learn and use. Simply describe the circuit in terms of the elements and their placement, and execute. Circuit descriptions may be saved onto cassette or diskette to be recalled at a later time for execution or editing. ACAP should be part of every circuit designer's program library.

LOGIC SIMULATOR (Apple only; 48K RAM) **Price: $24.95 Cassette/$28.95 Diskette**
With LOGIC SIMULATOR you may easily test your complicated digital logic design with respect to given set of inputs to determine how well the circuit will operate. The elements which may be simulated include multiple input AND, OR, NOR, EXOR, EXNOR and NAND gates, as well as inverters, J-K and D flip-flops, and one-shots. The response of the system is available every clock cycle. Inputs may be clocked in with varying clock cycle lengths/displacements and delays may be introduced to probe for glitches and race conditions. At the user's option, a timing diagram for any given set of nodes may be plotted using HIRES graphics. Save your breadboarding until the circuit is checked by LOGIC SIMULATOR.

LOGIC DESIGNER (North Star and CP/M only) **Price: $34.95 Diskette**
LOGIC DESIGNER is an exceptional Computer Aided Design (CAD) program. With it you may convert a large and complicated digitial truth table (the functional specification) into an optimized Boolean logic equation. This equation may then be *easily* converted into a circuit design using either NAND or AND/OR gates. Operationally, LOGIC DESIGNER is composed of a BASIC program which calls in a machine language routine to reduce execution time. Example: For a 7 variable by 127 line table, the processing time is only two minutes. LOGIC DESIGNER is clearly a fast and powerful tool for building digital circuitry.

ORDERING INFORMATION

All orders are processed and shipped within 48 hours. Please enclose payment with order and include the appropriate computer information. If paying by VISA or Master Card, include all numbers on card.

Shipping and Handling Charges
Within North America: Add $1.50
Outside North America: Add 10% (Air Mail)

Delivery
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Deduct 10% when ordering 3 or more programs. Dealer discount schedules are available upon request.

8" CP/M Disks
Add $2.50 to the listed diskette price for each 8" floppy disk (IBM soft sectored CP/M format). Programs run under Microsoft MBASIC or BASIC-80.

5¼" CP/M Disks
All software available on 8" CP/M disks is also available on 5¼" disks, North Star format.

Ask for **DYNACOMP** programs at your local software dealer. Write for detailed descriptions of these and other programs from **DYNACOMP**.

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Rochester, New York 14618
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Office phone (9AM-5PM EST): (716)442-8960

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New York State residents please add 7% NYS sales tax.

CIRCLE 136 ON READER SERVICE CARD

COMPUTERS

S-100, 16-BIT COMPUTER SYSTEMS

A line of S-100, 8086, 16-bit microcomputer systems has been introduced by Tecmar, Inc.

The Tec-86 includes the 8086 CPU with vectored interrupts, 64 kilobytes of dynamic RAM or 32 kilobytes of static RAM expandable to one megabyte, two RS-232 serial ports, three 8-bit parallel ports, EPROM boot for CP/M-86, double density floppy disk controller, dual 8" Shugart floppy disk drives, all metal enclosure, power supplies and cabling. $3,990.

The Tec-86W includes all of the above plus a 31-megabyte Winchester hard disk drive and 256 kilobytes of RAM. $9,990.

Software available for these systems includes CP/M-86, Microsoft Basic-86, and Pascal/M86.

Tecmar, Inc., 23600 Mercantile Rd., Cleveland, OH 44122. (216) 464-7410.

CIRCLE 351 ON READER SERVICE CARD

TERMINALS & I/O

VIDEO MONITOR

A 12" video monitor for microcomputers has been introduced by Zenith Data Systems.

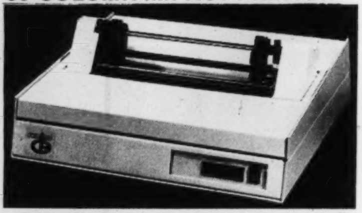
The monitor has a green screen and a switch to select either 40- or 80-character display.

The ZVM-121 displays an 8 x 10 character matrix and up to 24 lines of information. It has a bandwidth greater than 12.5 Mhz and a rise time of about 60 nanoseconds.

The ZVM-121 will be available from Zenith Data Systems computer distributors and dealers, Heathkit Electronic Centers, and through the Heath mail order catalog.

CIRCLE 352 ON READER SERVICE CARD

80-COLUMN IMPACT PRINTER



Data Electronic Devices announces the Model DE-80SG impact printer. The Model DE-80SG includes the features of the most 80-column tractor drive printers, but can also be programmed to store in internal EPROM up to seven full character sets simultaneously; be called individually on a parallel RS-232 or series 20 mA loop via "cell call"; generate bar codes for use in food stores with tractor labels; produce an answer back message so the host computer can see if the printer is on line and active. $995.

Data Electronic Devices, Inc., 18 Bridge St., Salem, NH 03079. (603) 893-2047.

CIRCLE 353 ON READER SERVICE CARD

TINY TERMINAL

The Lex-21 terminal from Lexicon Corporation features a built-in modem, a full function keyboard, and a thermal printer which displays upper and lower case characters. It measures 8 1/2" x 11" x 2 3/4", weighs 5 lbs., and easily fits into half a standard briefcase.

A 2K memory for text composition and editing and a 1K line buffer are standard in the Lex-21. An industry compatible communications protocol allows transmission rates of either 10 or 30 characters per second. Options include a numeric keypad and a leather carrying case. $1195.

Lexicon Corporation, 8355 Executive Center Dr., Miami, FL 33166. (305) 592-4404.

CIRCLE 354 ON READER SERVICE CARD

PERIPHERALS

I/O EXTENDER FOR APPLE

Versa Computing announces a peripheral device for Apple II computers. E Z Port extends the I/O port to the outside of the computer for easy changeover from game paddles to joystick, VersaWriter, etc.

E Z Port is a board which adheres to the side of the computer with a special foam adhesive strip. A 24" cable connects to the game I/O inside the Apple.

E Z Port incorporates a ZIP socket (Zero Insertion Pressure) in its design. ZIP sockets are said to increase the life of 16-pin connectors, because no pressure is exerted within the socket until the ZIP's cam lever is switched to the engage position. $24.95.

Peripherals Plus, 39 E. Hanover Ave., Morris Plains, NJ 07950. (800) 631-8112. In NJ (201) 540-0445.

CIRCLE 239 ON READER SERVICE CARD

SMART TERRAPIN-APPLE INTERFACE

Terrapin, Inc. announces a smart Terrapin-Apple Interface for its robot, the Turtle. The interface enables the user to control the Turtle from a high level language (Basic, Pascal, Logo, etc.) via simple I/O statements.

The smart interface includes a parallel port, a separate regulated current-limited power supply, and interface software. The apples apples apples apples apples

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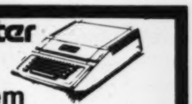

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Apple Joystick "GESU"	54.95	
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Introl/X-10	180.00	
Introl/X-10 Remote Cont. Sys.	249.00	
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CPS Multifunction	229.00	New
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Centronics Printer I/O	179.95	
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Apple Clock	244.95	
Apple Graphics Tablet	599.95	
Apple Prototype Card	21.95	
Apple Disk II w/ cont. 3.3	559.95	
Apple Disk II	459.95	
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Corvus 10Mb Hard Disk	Call	
Corvus 20Mb Hard Disk	Call	New
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Corvus Mirror	Call	
ACP 16K Upgrade Kit	24.95	
Scott Voice Recognition VET-2	895.00	New

apple /// Triple Play!

1.	2.	3.
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New apple software

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Visitrend/Visiplot—Visiplot w/Trend Analysis	239.00	
Visidex—The Ultimate DBMS Visicalc Compatible	219.00	
Visiterm—Communicate w/other Systems	209.00	
BPi General Ledger	299.00	
BPI Accounts Receivable	299.00	
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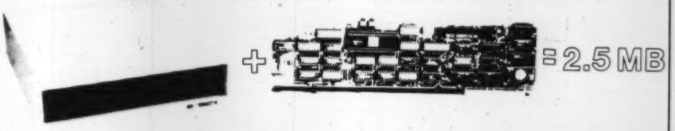
Microcom Microcourier	229.00	
Microcom Microtelegraph	229.00	
Accounting Plus II Biz Pkg.	1250.00	
Stoneware DB Master	189.00	
Stoneware Utility Pkg (For above)	89.00	
WORDSTAR-The Benchmark of Wordprocessing software requires Z-80 & 80x24	349.00	
VTS-80 CP/M-Wordprocessor has no screen menus uses new keycaps (supplied) to display Key functions	319.00	New
MAIL-MERGE-A Wordstar Enhancement Pkg. allows form-letter generation & chained printing	169.00	
SPELLGUARD-Will proofread Wordstar & VTS-80 Text files against an expandable 20,000 word dictionary	169.00	
SUPER SORT-Will sort, merge, & perform record selection on your CP/M Data Files	169.00	
FORTRA 80-By Microsoft	195.00	
COBOL 80 By Microsoft	749.00	
ACS BASIC ACCOUNTING SYSTEM, Total accounting system includes G/L, A/R, A/P, PAYROLL	699.00	New

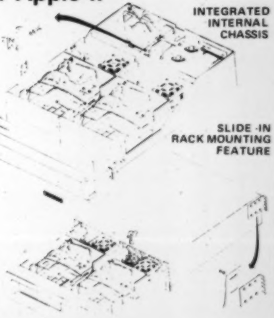
NEW

Breakthrough In Mass Storage!

Vista Dual 8" Subsystem



New Double Sided Double Density DMA Floppy Disk Subsystem For Your Apple II



Features:

- High speed DMA transfer of data (1 microsecond byte)
- Complete documentation provided — includes theory of operation, source code for DOS enhancement utilities, schematics and diskette
- Uses all standard Apple DOS commands (OPEN, CATALOG, LOCK, DELETE, LOAD, etc.) except for INIT which has been improved and enhanced in a Vista format routine.
- Compatible with Apple DOS 3.2/3.3, Pascal 1.1 and CPM 2.2 (with the Z80 soft card by Microsoft)
- 2K x 8 PROM contains Autoboot functions and all eight-inch floppy driver code allowing complete compatibility with Apple DOS 3.2/3.3
- 120 days parts and labor warranty
- Immediate delivery

System Includes:

- Vista V1000 subsystem w/case power supply & two QUME DATATRAK 8 Disk Drives
- Vista A800 Quad Density DMA Disk Controller with software
- 5-foot interconnecting cable (50 pin)

	List Price
V1000 —	2295.00
A800 —	595.00
Cable —	49.00
Ready To Run	$2939.00

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parallel port I/O card contains the interface software in ROM, and plugs into one of the Apple's Peripheral Interface Connectors

Terrapin, Inc., 678 Massachusetts Ave. Rm. 205, Cambridge, MA 02139. (617) 492-8816.

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ATARI I/O PACKAGE

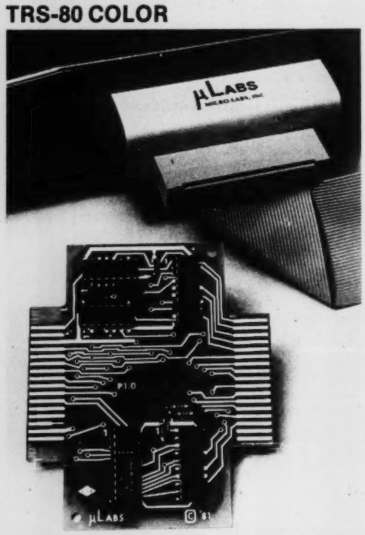
The Mosaic I/O Package connects the Atari computer to the real world. The four ports on the front of the Atari computer connect directly to a PIA for use as output as well as input ports.

The I/O package comes with four nine-pin connectors, four 12" lengths of nine-conductor ribbon cable, and instructions for use. The documentation includes examples of home-built program controllers, how to access the ports through Basic commands, shadow registers, or directly, and how to set-up and address the ports for output. $18.

Mosaic Electronics, P.O. Box 748, Oregon City, OR 97045.

CIRCLE 356 ON READER SERVICE CARD

PRINTER INTERFACE FOR TRS-80 COLOR



The CPrint module for the TRS-80 Color Computer provides a plug compatible Centronics type parallel printer port for use with all parallel Radio Shack, Centronics, Epson, and similar printers.

Software contained in permanent on-board memory offers transparent operation with the following features: all LLIST and PRINT #-2 output is automatically re-routed, a screen-print function can be initiated at any time, line width can be set, the graphics in the LPVII can be accessed, page length can be set, and blank lines are inserted between pages.

The CPrint module is a fully buffered, 8-bit I/O port which will interface with any Model I/III product which plugs into the printer port. $49.95.

Micro-Labs, Inc., 902 Pinecrest, Richardson, TX 75080.

CIRCLE 357 ON READER SERVICE CARD

ASCII VOCALIZER I

The ASCII Vocalizer I converts serial ASCII data from a computer system into speech. Data is input through the RS-232 interface on the vocalizer.

The unit can be used as a stand-alone peripheral for paging, instructions, vocal reminders or any automatic speech output. It can also be added to an existing terminal to vocalize portions of the terminal display such as error conditions, operator messages or prompts.

To produce speech the programmer outputs serial ASCII data to the Vocalizer through an exisitng RS-232 port to which the Vocalizer is attached.

The standard unit has a 200-word memory and expansion capabilities for 600 additional words. $1395.

Micro Communications, Inc., 1509 Government St., Suite 214, Mobile, AL 36604. (205) 478-1777.

CIRCLE 358 ON READER SERVICE CARD

DIRECT-CONNECT MODEM FOR TRS-80 I AND III

ESI Lynx has introduced a new version of its Lynx direct-connect telephone modem for both TRS-80 Model I and Model III.

Standard features include auto-dial and auto-answer functions, originate/answer, programmable word length, parity, number of stop bits and full/half duplex. Also provided are active clear and break keys and "control," programmable I/O porting, and either keyboard-dialing or stored-number-selection operation.

It connects to either the keyboard or the expansion interface on Model I, and to the 50-pin I/O bus jack on Model III. $299.95.

ESI Lynx at 123 Locust St., Lancaster, PA 17602. (717) 291-1116.

CIRCLE 359 ON READER SERVICE CARD

GRAPHICS

COMPUTER SLIDE SYSTEM

Using the Apple II as the base computer it is now possible to create informational and artistic slides.

The Model T Computer Slide System allows users to create full color slides by drawing with a light pen on a graphic tablet. Squares or bars are created by touching two points. Circles are created by touching the center and a point on the circumference. Type (three styles available) is entered via the keyboard. Slides can also be created by entering data strictly from the keyboard.

The retrofit package for a 48K Apple with two disk drives includes software and reproduction modules. $4895.

Toucan Company, 1033 Battery St., San Francisco, CA 94111. (415) 392-2970.

CIRCLE 360 ON READER SERVICE CARD

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LPS II
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A high-resolution light pen system with full 280 x 192 Apple hi-res is now available. With the light pen, hi-resolution graphics information can be entered through the screen of the Apple.

LPS II is compatible with Applesoft and Integer Basic, Fortran, Pascal, Pilot, Forth, and CP/M.

Usable in every Screen Mode of the Apple, the LPS II provides the user's program with the horizontal and vertical location of the pen point at a full 60Hz rate. $285.

Gibson Laboratories, Building 10, 406 Orange Blossom, Irvine, CA 92714.

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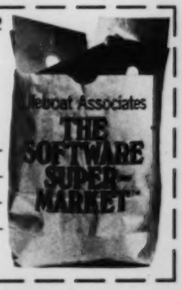

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NewBasic, from Modular Software Associates, adds tremendous power and flexibility to Level II or disk Basic. The disk version includes a unique CREATOR program which allows you to customize NewBasic to inlude any or all of over 30 new commands. Level II NewBasic includes all of the non-disk commands found in disk NewBasic. A few of the many new features added include:

SPOOLING-DESPOOLING (disk version)—Allows printer output to be "spooled" to disk instead of being printed. Later, the file may be "despooled" (i.e. printed out) while the computer can still run Basic, as usual (another program, or you input a program!).

NEW TRACE UTILITY—Now trace more than just a line number! This trace facility displays (LISTs) the line being executed, as well as the current value of specified variables and expressions.

SOUND AND GRAPHICS—Easily create music or sound effects with the versatile SOUND command. Lines and rectangles may be effortlessly drawn with the new graphics commands: LINE, RECT, and FILL.

RS232—NewBasic allows you to initialize your RS-232-C, receive input from it, or output to it—all from within Basic!

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Disk version (1 drive, 32K min.) ($31.75 CA) **$29.95**

Level II (cassette) version (16K min) $19.95 (may be upgraded to disk for $10.95) **$19.95**

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book, details uses (CIE) $11.95 ($12.67 CA)

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New Products, continued...

DISK SYSTEMS

REMOVABLE CARTRIDGE WINCHESTER DRIVE

New World Computer Company has introduced a 5 1/4" fixed and removable cartridge drive.

The Mikro-Disc V drives are available in five models, ranging from the Model 2/0—the lowest-priced Winchester drive with 2 megabytes of fixed storage—to the Model 4/4, with 4 megabytes fixed and 4 megabytes removable storage.

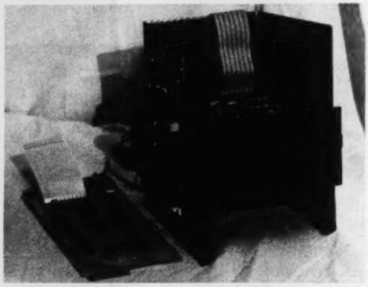
The removable cartridge is available in 2-megabyte and 4-megabyte versions in a hermetically sealed package that comes complete with the company's multiple-head assembly, media and actuator positioner.

Prices start under $500 for the Model 2/0 and under $1,200 for the Model 4/4.

New World Computer Company, 3176 Pullman Street #120, Costa Mesa, CA 92626. (714) 556-9320.

CIRCLE 362 ON READER SERVICE CARD

DISK SUBSYSTEM FOR MODEL III



The Disk III, offered by VR Data, is a 5 1/4" disk storage subsystem for the TRS-80 Model III.

The basic unit consists of controller, power supply, mounting bracket, one 40-track (6ms) disk drive and associated cabling. Disk III options include a second internal 40-track drive, 80-track disk drives, two-sided, 40-track drives, or two-sided 80-track drives.

The basic unit is priced at $599. The second 40-track drive is $265.

VR Data Corporation, 777 Henderson Blvd., Folcroft, PA 19032.

CIRCLE 363 ON READER SERVICE CARD

DISK STORAGE FOR HEATH 88/89

A floppy disk controller board, which is compatible with the Heath 88/89 microcomputer and allows users to double their 5 1/4" disk storage capacity without adding drives or disks, is now available from Controlled Data Recording Systems, Inc.

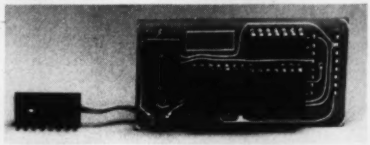
Designated the FDC-880H, the board runs under the CP/M 2.2 operating system and is capable of handling up to four Shugart compatible 5 1/4" or 8" drives simultaneously. In addition, the FDC-880H handles single and double-sided operation; single and double-density data.

It converts the 5 1/4" hard sectored disks to standard soft sector double density. The FDC-880H occupies any I/O slot in the H88/H89 microcomputer without modification. $695.

CDR Systems, Inc., 7667 Vickers St., Suite C, San Diego, CA 92111.

CIRCLE 364 ON READER SERVICE CARD

TYPE AHEAD BUFFER AND DISK SUBSYSTEM

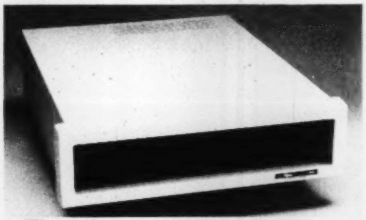


Vista Computer Company has announced the Model 150 Type Ahead Buffer, which is compatible with all Apple II computers and software.

Featuring a 40-character type ahead capability, the Model 150 eliminates the need to wait for computer prompts before entering the next command or data.

The Model 150 requires no software patches, cuts or jumpers. $49.95.

Also available from Vista is the V1000 Dual 8" Drive Subsystem.



The unit accommodates mass storage units ranging from single-sided, 8" floppies to 20-megabyte streaming tape cartridges and 40-megabyte Winchester disk drives. On-line floppy disk storage capacity ranges from 250 kilobytes to 2.5 megabytes.

The V1000 with a choice of drive configurations, is priced from $1,095 to $2,295.

Vista Computer Company, 1317 E. Edinger Ave., Santa Ana, CA 92705. (714) 953-0523.

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All are 1981 models with Apple RAM. 64K unit is 48K unit with Microsoft 16K RAM board. 48K and 64K units include Applesoft and Integer BASIC's when used with DISK II. The Apple II no longer comes with game paddles. Paddles are extra - CALL.

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for Apple II/II+

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CP/M for Apple

Chuck Carpenter

CP/M and much of the CP/M related software is now available for the Apple II. The Z-80 Softcard by Microsoft makes it possible. Microsoft's package includes the Z-80 board, two manuals, and diskettes for 13 and 16 sector systems.

CP/M stands for "control program for microcomputers," and it is probably the most popular independent operating system around. Many do-it-yourself systems and over a dozen off-the-shelf systems now being advertised use this operating system developed by Digital Research. Consequently, there are dozens of programs available for use with CP/M. Some of them have already been converted for use with the Apple II. And a few originals for the Apple have started to appear. Additionally, with CP/M, there are several programming language options. Microsoft offers MBasic, Fortran, Cobol, Pascal, and an MBasic compatible compiler. There is also a very comprehensive editor/assembler available from Microsoft.

Hardware

Only one board, with the Z-80, is needed. The board is manufactured for Microsoft by California Computer Systems. It is a quality piece of work. This board plugs into one of the expansion connectors; slot 7 is preferred. Once the board is installed, you are ready to boot the system. Depending on the configuration of your system you can use either the 13 sector disk or the 16 sector disk. If you have a Language Card or other 16K memory board, you can take advantage of the maximum 54K memory capability.

Compatibility with other hardware in the Apple system is limited. You can use an 80-column board only in slot 3. With an 80-column board in slot 3, the boot default is to the video board. The modem has to be in a certain slot as does the printer. At least one software package is available to let you communicate with the Softcard and a Hayes Modem (It's called Z-TERM and it works!). If you are using the Apple language system, the hardware compatibility is almost identical. The hardware requirements and limitations are spelled out clearly in the manual.

There are many good reasons to get a Z-80 Softcard for your Apple II.

Software

Languages and utility programs are on the two diskettes included with the card. Each disk contains the versions of Basic and programs to help you configure and use the system. There is one Basic called MBasic and one called GBasic. MBasic includes all of the features of Microsoft Basic-80 and low-res graphics. GBasic also includes hi-res graphics. More memory is required to use GBasic and it imposes some limitations, but I'll get into this more when memory usage is discussed.

Utilities include programs to convert your Applesoft Text files to Basic-80 text files. I've converted Applesoft programs to files, then converted them to Basic-80 programs. They run fine as long as no syntax rules are violated. Other utilities include configuration programs, conversion to a 56K system, format and copy programs, and programs to upload/download to another computer.

Also included are the programs and utilities normally associated with CP/M, including an editor, an 8080 assembler (no, none for a Z-80), one for disk status, a debugger/tester, and a program to transfer files between disks. Other programs include one to convert assembly programs, one to run a chain of commands (like the Apple EXEC command), and a memory dump program. Programs built directly into the CP/M operating system include ERAse, DIRectory, REName, SAVE, and TYPE.

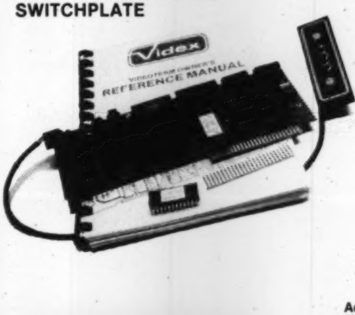
The Basic included with the package is one of the most powerful available. There is a line editor built-in—very handy during program development. Commands include RENUMber, PRINT USING, RANDOMIZE, SWAP (to exchange variables), and WHILE...WEND. There are many other powerful commands too, including several intrinsic commands to help with such things as hex to decimal and octal to decimal conversion. Disk I/O commands

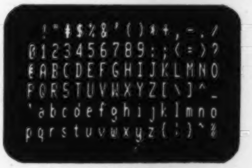
The Text Solution for APPLE II®

Now APPLE II® Owners Can Solve Text Problems With VIDEOTERM 80 Column by 24 Line Video Display Utilizing 7 X 9 Dot Character Matrix

Perhaps the most annoying shortcoming of the Apple II® is its limitation of displaying only 40 columns by 24 lines of text, all in uppercase. At last, Apple II® owners have a reliable, trouble-free answer to their text display problem. VIDEOTERM generates a full 80 columns by 24 lines of text, in upper and lower case. Twice the number of characters as the standard Apple II® display. And by utilizing a 7 by 9 character matrix, lower case letters have true descenders. But this is only the start.

VIDEOTERM, MANUAL, SWITCHPLATE





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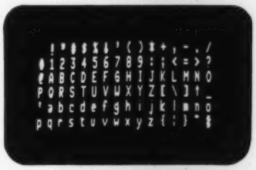

7X9 MATRIX
24X80 STANDARD

VIDEOTERM

BASICs VIDEOTERM lists BASIC programs, both Integer and Applesoft, using the entire 80 columns. Without splitting keywords. Full editing capabilities are offered using the ESCape key sequences for cursor movement. With provision for stop/start text scrolling utilizing the standard Control-S entry. And simultaneous on-screen display of text being printed.

Pascal Installation of VIDEOTERM in slot 3 provides Pascal immediate control of the display since Pascal recognizes the board as a standard video display terminal and treats it as such. No changes are needed to Pascal's MISC.INFO or GOTOXY files, although customization directions are provided. All cursor control characters are identical to standard Pascal defaults.

Other Boards The new Microsoft Softcard* is supported. So is the popular D. C. Hayes Micromodem II*, utilizing customized PROM firmware available from VIDEX. The powerful EasyWriter* Professional Word Processing System and other word processors are now compatible with VIDEOTERM. Or use the Mountain Hardware ROMWriter* (or other PROM programmer) to generate your own custom character sets. Naturally, VIDEOTERM conforms to all Apple OEM guidelines, assurance that you will have no conflicts with current or future Apple II* expansion boards.

Advanced Hardware Design VIDEOTERM's on-board asynchronous crystal clock ensures flicker-free character display. Only the size of the Pascal Language card, VIDEOTERM utilizes CMOS and low power consumption ICs, ensuring cool, reliable operation. All ICs are fully socketed for easy maintenance. Add to that 2K of on-board RAM, 50 or 60 Hz operation, and provision of power and input connectors for a light pen. Problems are designed out, not in.

Available Options The entire display may be altered to inverse video, displaying black characters on a white field. PROMs containing alternate character sets and graphic symbols are available from Videx. A switchplate option allows you to use the same video monitor for either the VIDEOTERM or the standard Apple II* display, instantly changing displays by flipping a single toggle switch. The switchplate assembly inserts into one of the rear cut-outs in the Apple II* case so that the toggle switch is readily accessible. And the Videx KEYBOARD ENHANCER can be installed, allowing upper and lower case character entry directly from your Apple II* keyboard.

Firmware 1K of on-board ROM firmware controls all operation of the VIDEOTERM. No machine language patches are needed for normal VIDEOTERM use.

Firmware Version 2.0

Characters	7 x 9 matrix	Display	24 x 80 (full descenders) 18 x 80 (7 x 12 matrix with full descenders)
Options	7 x 12 matrix option; Alternate user definable character set option; Inverse video option.		

Want to know more? Contact your local Apple dealer today for a demonstration. VIDEOTERM is available through your local dealer or direct from Videx in Corvallis, Oregon. Or send for the VIDEOTERM Owners Reference Manual and deduct the amount if you decide to purchase. Upgrade your Apple II* to full terminal capabilities for half the cost of a terminal. VIDEOTERM. At last.

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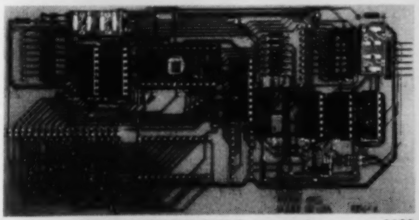

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are easier to use than in Applesoft. You can develop sequential or random files with specific commands, and they do not require prefixing to identify them as disk commands. (Remember that Basic-80 was specifically designed to be a disk based system. Applesoft was not.)

Documentation

Two manuals, about half-page size, include the system documentation. One manual contains hardware definitions and the Digital Research CP/M manual. The other contains all the MBasic/GBasic programming definitions, plus all the special features related to implementation on the Apple II.

Also included was a copy of the Mostek Z-80 Micro-Reference Manual, the only source of Z-80 specific information supplied.

Several complaints have been heard about the CP/M Reference Manual. Mostly that it is difficult to comprehend. It is! But, there are several sources of information that will help. I'll cover them later.

Memory Use

One of the clever features of the Softcard is its use of memory. The two microprocessors use memory differently: for instance, the 6502 expects the entry jump table to be at the top of high memory, while the Z-80 expects it to start at the beginning of low memory. To compensate for this, Z-80 address 0000H is at 6502 address $1000. Note the difference in convention for identifying a hex number. Table 1 shows the correlation of memory between the two systems. In the July '81 "Applecart," I included a program to help find your way around Z-80 memory. You might find it useful with the softcard.

Z-80 ADDRESS	6502 ADDRESS	
0000H-0FFFH	$1000-$1FFF	Z-80 location zero
1000H-1FFFH	$2000-$2FFF	
2000H-2FFFH	$3000-$3FFF	
3000H-3FFFH	$4000-$4FFF	
4000H-4FFFH	$5000-$5FFF	
5000H-5FFFH	$6000-$6FFF	
6000H-6FFFH	$7000-$7FFF	
7000H-7FFFH	$8000-$8FFF	
8000H-8FFFH	$9000-$9FFF	
9000H-9FFFH	$A000-$AFFF	
0A000H-0AFFFH	$B000-$BFFF	
0B000H-0BFFFH	$D000-$DFFF	
0C000H-0CFFFH	$E000-$EFFF	
0D000H-0DFFFH	$F000-$FFFF	6502 RESET, NMI, BREAK vectors
0E000H-0EFFFH	$C000-$CFFF	6502 memory mapped I/O
0F000H-0FFFFH	$0000-0FFF	6502 zero page, stack, Apple screen

Apple II CP/M Memory Usage

Here is how the Apple memory is used by Apple CP/M:

6502 ADDRESS	Z-80 ADDRESS	PURPOSE
$800-$FFF	0F800-0FFFF	Apple disk drivers and disk buffers
$400-$7FF	0F400-0F7FF	Apple screen memory
$200-$3FF	0F200H-0F3FFH	I/O Configuration Block.
$000-$1FF	0F000H-0F1FFH	Reserved 6502 memory area – 6502 stack and zero page.
$C000-$CFFF	0E000H-0EFFFH	Apple memory mapped I/O
$FFFA-$FFFF	0DFFAH-0DFFFH	6502 RESET, NMI, and BREAK vectors.
$D400-$FFF9	0C400H-0DFF9H	56K Language Card CP/M (if Language Card installed)
$D000-$D3FF	0C000H-0C3FFH	Top 1K of free RAM space with 56K Language Card CP/M
$A400-$BFFF	9400H-0AFFFH	44K CP/M. (Free memory with 56K CP/M)
$1000-$A3FF	0000H-093FFH	Free RAM (CP/M uses lowest 256 bytes)

Table 1. Memory organization with CP/M installed in the Apple II.

Memory available for Basic programs depends on the version used. It also depends on your system configuration. If you have a 48K machine (minimum recommended) here's what you get:

MBasic 13 sectors: 14K+ without GBasic.

And, with a 56K sytem, here is what you get:

MBasic 16 sectors: 26.5K with the Language Card.

GBasic 16 sectors: 17.5K with the Language Card.

As you can see, it would not be practical to use GBasic without using the extra memory provided by the Language Card. Some of the other 16K expansion cards, such as the one by Microsoft, would give the same results.

Service and Support

Updates on problems have been promptly dispatched. Early versions had several bugs and errors, but Microsoft quickly dealt with them in documentation updates. Microsoft also provided early owners the option of returning their disks for an update.

Several readers have written to me about letters that go unanswered. I've written letters too and never received a reply. I've called and received very good responses and prompt replies. As in many companies these days, letters don't seem to get any attention. (It's very expensive to handle and respond to letters.) I had a problem with double line feeds with my 737 printer. I called, got someone to talk to right away, and a patch to fix the problem in a few days. The patch worked too. Except for letters, the support from Microsoft has been excellent.

Summary

If you are looking for a more powerful Basic, this system has it. If you want to get involved with another microprocessor, you can learn about the Z-80 with this sytem. If you want to learn about the CP/M operating system, you can do that too. There are many good reasons to get a Z-80 Softcard for your Apple II. I've enjoyed using mine. I really like the version of Basic supplied, and since I am not interested in graphics, there have been no conflicts using the Softcard with my Videx Videoterm 80-column board. You can find the Softcard at most computer stores for about $350.

Microsoft Consumer Products, 400 108th Ave., N.E., Bellevue, WA 98004. ☐

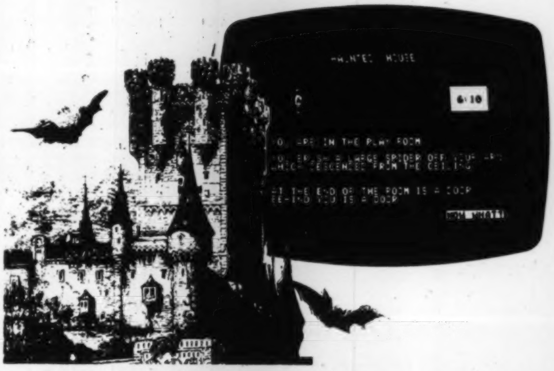
Apple II

sensational software

creative computing software

Haunted House

Cassette CS-4005
$11.95
Requires 16K



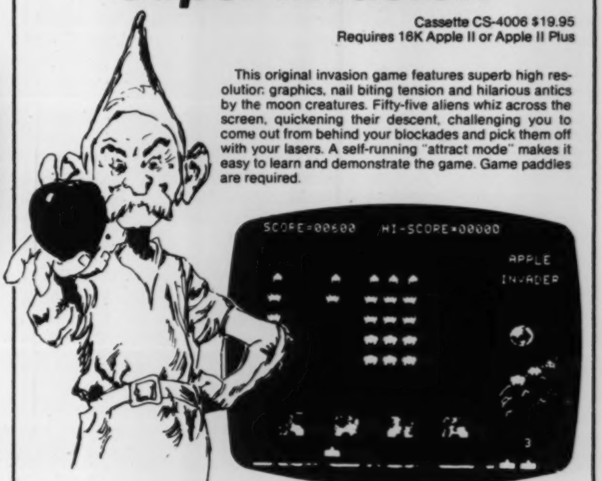
```
HAUNTED HOUSE

6:10

YOU ARE IN THE PLAY ROOM
YOU BRUSH A LARGE SPIDER OFF YOUR ARM
WHICH DESCENDED FROM THE CEILING

AT THE END OF THE ROOM IS A DOOR
BEHIND YOU IS A DOOR
NOW WHAT?
```

It's 6:00 pm and you have until midnight to find the secret passageway out of a large rambling HAUNTED HOUSE. During your search you'll encounter skeleton keys, charms, friendly ghosts, and evil spirits, Sound effects add to the eerieness. The layout changes in every game.

Super Invasion

Cassette CS-4006 $19.95
Requires 16K Apple II or Apple II Plus

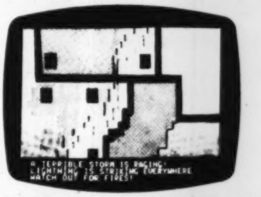
This original invasion game features superb high resolution graphics, nail biting tension and hilarious antics by the moon creatures. Fifty-five aliens whiz across the screen, quickening their descent, challenging you to come out from behind your blockades and pick them off with your lasers. A self-running "attract mode" makes it easy to learn and demonstrate the game. Game paddles are required.



```
SCORE=00600   HI-SCORE=00000
                          APPLE
                          INVADER
                               3
```

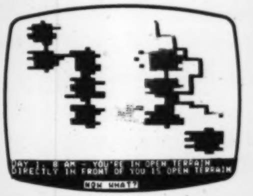
Outdoor Games

Cassette CS-4010 $14.95 4 Programs Requires 16K Apple II or Apple II Plus



```
A TERRIBLE STORM IS RAGING:
LIGHTNING IS STRIKING EVERYWHERE
WATCH OUT FOR FIRES!
```

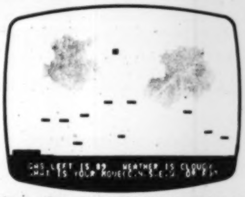
Forest Fire. Use chemical retardants and backfires to control raging forest fires.



```
DAY 1, 8 AM - YOU'RE IN OPEN TERRAIN
DIRECTLY IN FRONT OF YOU IS OPEN TERRAIN
NOW WHAT?
```

Treasure Island I. Your map shows buried treasure but unfortunately you don't know where you are. Try to find the treasure while moving about and observing your surroundings. You have a 3-day supply of food and water. You may find useful objects (compass, weapons, a horse) but watch out for hazards (robot guards, pirates, caves, crocodiles, mountain lions and more).

Treasure Island II. Same game except you have to use a metal detector to find the treasure.



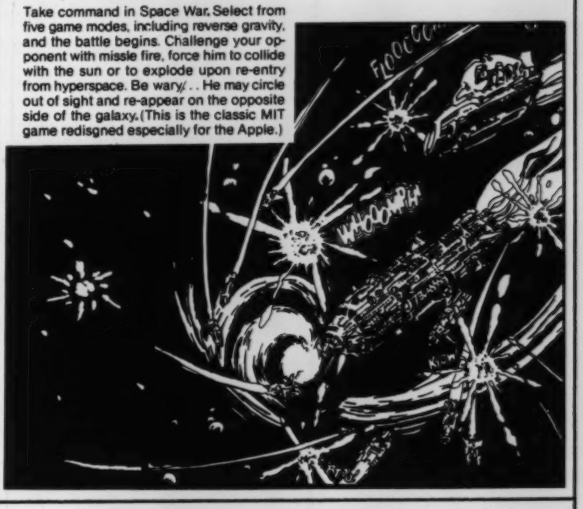
```
GAS LEFT IS 89   WEATHER IS CLOUDY
WHAT IS YOUR MOVE(C,N,S,E,W, OR F)?
```

Fishing Trip. Try to catch flounder and salmon while avoiding logs, sharks, bad weather and running out of fuel.

Space War

Cassette CS-4009 $14.95
Requires 16K
Apple II or Apple II Plus

Take command in Space War. Select from five game modes, including reverse gravity, and the battle begins. Challenge your opponent with missle fire, force him to collide with the sun or to explode upon re-entry from hyperspace. Be wary. . . He may circle out of sight and re-appear on the opposite side of the galaxy. (This is the classic MIT game redisgned especially for the Apple.)



Outdoor Games and Haunted House

Disk 4504, $24.95
Requires 32K Apple II or Apple II Plus

This disk contains all five programs from cassettes CS-4005 and CS-4010.

Super Invasion Space War

Disk CS-4508 $29.95
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Low Cost Voice Synthesis

All Ears for Type 'n Talk

Gordon Mc Comb

For years, computer hobbyists have seen voice synthesis as a distant fantasy—OK for comic books and novels, but too complex and expensive for the home computer den.

But that was yesterday!

Today, direct text-to-speech voice systems enable the home computer user to type in plain English, and the synthesizer automatically converts the written words into intelligible speech. Sure, this technology has been around for a while, but not at $345!

Votrax, an old and reliable name in voice synthesis, recently announced a product called Type 'n Talk. Type 'n Talk works with any computer and any language, has an unlimited vocabulary, is RS-232C serial interface compatible, and extremely easy to use.

Let's see what else Type 'n Talk has to say for itself.

An Inside Look

It all starts at your computer or terminal. Information, in the form of ASCII characters is sent through an RS-232C serial interface and into Type 'n Talk (TNT). This information is fed through very quickly—faster than the synthesizer could say the words. So a buffer has been inserted at the input to collect the information so it can be slowly dispersed as the words are spoken (your printer works in a similar fashion).

From the buffer, the data is sent to a text-to-speech translator, that decides how the words you typed will be pronounced.

From the translator, the information is sent to a voice synthesis chip. This chip creates a series of hissing, pocking, clicking, humming and other strange sounds that combine to form human speech. These sounds are sent through an internal amplifier and then to your speaker.

Connections

No special hardware modifications or devices are required to connect TNT to your computer system. However, you do need a standard RS-232C serial interface and cable.

Up to eight TNTs can be connected to one computer system, and each can be independently addressed. This is particularly helpful in the classroom.

You must make two other connections to complete your TNT set up: one for power supply cable (included) and the other for the speaker connection. You can connect TNT to any 8-ohm speaker or wire it into your hi-fi if the on-board 1-watt amp isn't strong enough for your needs (TNT does not have an internal speaker).

You must also select the baud rate. A series of small switches on the back of TNT controls the rate from 75 to 9600 baud. The data buffer built into TNT is capable of holding 750 bytes, or about one minute of speech. At 9600 baud, this buffer takes less than one second to fill. So while TNT is speaking, your computer is free to do other tasks.

System Ready

When everything is properly connected, Type 'n Talk announces "system ready." Adjust the volume control to a comfortable listening level. The frequency control changes the speed of the voice.

On computers that don't have a built-in serial interface, you'll need to instruct the computer on where to send the information so it'll get to TNT. Generally, information transfers to Type 'n Talk can be accomplished with the same commands and software used to send data to a terminal, printer or tape drive. TNT's instruction manual gives a few insights on hooking it into your computer.

Many of your programs can be run "as is," others you may want to modify slightly to make better use of the voice system. Whenever there is a PRINT statement, TNT can be made to speak the text. You can also modify your program so it will speak some of the statements, and print out the rest. Any combination is possible.

Audible speech is generated by the letters A through Z and numerals 0 through 9 only. Characters such as %, @, &, (and so on) have either no effect or produce periods of silence.

Capital letters are treated in two different manners. If only the first letter of a word is capitalized, then TNT will pronounce the word in the usual fashion. But if the first two (or more) letters are caps, TNT will spell out the word, letter by letter.

For example: The words typed "T-H-E" and "T-E-D" are pronounced "tee-aych-ee" and "tee-ee-dee." The words "t-h-e" and "T-e-d" are pronounced "the" and "ted."

This feature can be turned on and off under software control, depending on your needs.

Correction

By now, you've probably realized that TNT will not pronounce each and every word it encounters perfectly. There are so many variants and broken rules in the English language, that no computer—no matter how sophisticated—could properly pronounce every word.

But TNT makes it fairly easy to obtain near-perfect speech every time. You can simply misspell the words to get a better pronunciation. For instance, if you want TNT to say the word "vase," but want it pronounced "vaze," just spell it that way. Other words such as "clothes" would be improperly pronounced because the root word is said differently (cloth). To get the right sound, misspell it "cloze." Type 'n Talk will pronounce "data" as "dota." You'd need to spell it "dayta" if you wanted it to sound right.

Another way to correct pronunciation is to split the word into its component parts. For instance, the word "baseball"

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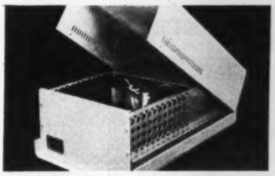

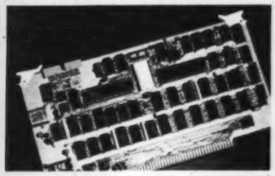

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A Few Words About Voice Synthesis

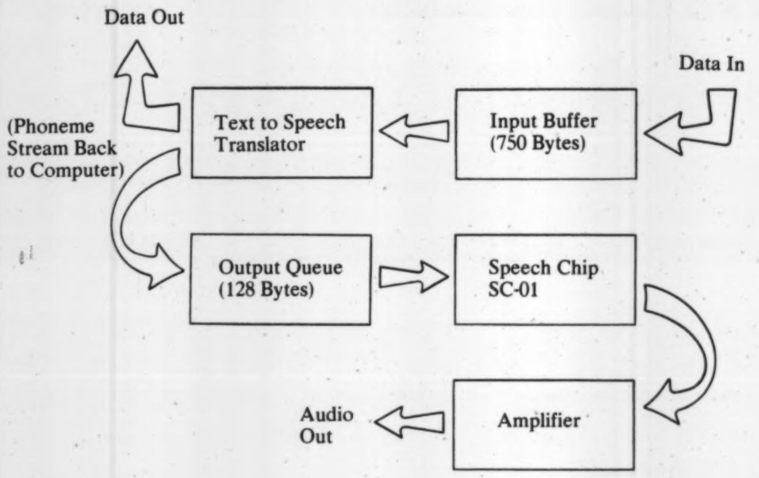
There are three major ways to give your computer a voice. One system, pioneered by Texas Instruments, is called Linear Predictive Coding (LPC) where an announcer speaks into a microphone connected to a computer. The computer digitizes and condenses the speech and stores it in memory. That memory can be duplicated and inserted in a finished product. In this way, calculators, toys and other electronic devices can be given voices—but can only speak those words originally recorded. Words can be combined to create complete phrases, such as "six times six equals thirty-six." Each word is recorded separately. A small computer inside the device picks out the proper sequence of words and strings them together.

Another method used by many computer hobbyists is similar to LPC, but allows the user to speak into a microphone and digitize his own voice. His voice is then "recorded" in memory, and recalled from the computer at will. Super Talker from Mountain Computer provides this type of speech capability for the Apple.

Phoneme-based synthesis is perhaps the truest form of voice synthesis. It creates words by imitating the *sounds* produced by the human vocal tract. In this way, words, phrases and even singing can be produced without the need to prerecord or digitize speech. One such unit was built for the Radio Shack TRS-80. However, it takes several hours to input a page or two of text even for the most experienced operator.

The first synthesizers of this kind were built by Bell Laboratories in the 50's. (The first working model is featured on the *Philadelphia Computer Music Festival* LP record; $6 from Creative Computing.) Later, less elaborate commercial versions of this type of synthesizer were shown widely in the early 70's, however, all suffered from a lack of inflection. This gave them a decided Scandinavian or Eastern European accent and did not contribute to their widespread acceptance.

Text-to-speech synthesis, still in its infancy, eliminates the tedious programming of the phoneme-based synthesizer. Text is typed into a computer and is translated by a built-in language interpreter. The translator has been programmed to correct for the majority of pronunciation variances inherent in our language.—DHA



Block Diagram of Type 'n Talk. This is a simplified block diagram of the major functions of Type 'n Talk. Data is fed into a buffer where it is released on your command. It then goes into a text-to-speech translator for English syntax conversion and correction. The translated data is fed into an output queue, designed to allow additional data to be fed into the buffer while outputting speech. The data is then routed into the SC-01 speech chip, which creates the actual voice. The sound is fed into an amplifier and out to an external speaker.

would sound strange, so type it "base ball." "Computer" could be written as "com puter" for a clearer sound.

There may be times when correcting the pronunciation using the above methods will not produce an acceptable result. Foreign words, English words with a foreign origin or a person's name often need a little extra attention to sound just right.

The character "~" accesses the voice chip directly, bypassing the text-to-speech translator. In this way, you can program TNT sound-by-sound to produce a word. You then need to key in the word using the special ASCII codes given in the back of the instruction manual. Votrax gives this example on direct programming of the voice chip for the name "Robert.

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```
* CHECKBOOK UTILITY *

1  -  CHANGE ACCOUNT NAME
2  -  EDIT CODE MACRO LIST
3  -  EDIT ITEM MACRO LIST
4  -  SET / CHANGE PRINTER COMMANDS
5  -  SEND MACRO LISTS TO PRINTER
6  -  TRANSFER USER DATA, ITEM AND
      CODE MACROS TO ANOTHER DISKETTE
7  -  QUIT / RETURN TO 'FMS'
```

1. Say the name "Robert."
2. Number of vowel sounds = 2 ("o" and "er.")
3. Number of consonant sounds = 3 ("r," "b" and "t.")
4. Match these sounds with characters in Phonetic Conversion Chart in manual.
5. Phonetic characters = R, AH, B, ER, T.
6. Match these with ASCII characters (found in manual also) so you can key them into your computer = k, d, N, z, j.
7. Create phoneme block = "~"
8. Insert ASCII sequence = kdNzj.
9. End phoneme block = type a "?"
10. Activate TNT; hear the name "Robert."

The special ASCII characters that were used in this example to represent different phonemes, can also be received from Type 'n Talk. Under software control (almost everything is with TNT), you can ask the synthesizer to send the stream of phonemes back to your computer. If you need to input an entire sales pitch for a convention, you can type it in English, then turn around and review the phoneme string. Changes can be easily made by adjusting the phonemes to create a better pronunciation of the problem words.

Toy or Tool?

How important is voice synthesis? How can it be used in home computing? Many of your programs, whether they be for entertainment, education, business or home use, can be enhanced by voice output. Leaving commands and statements to a synthesizer frees the CRT display for the things it does best: graphic illustrations, text, charts, graphs, and so on. Voice command is an attention grabber.

Some applications of voice synthesis could be in aiding the visually handicapped, teaching and training, banking, computerized phone information services (shopping, classified ads, etc.), industry, manufacturing, accounting—the list goes on.

For home use, you might program TNT to say "Warning, tape drive not ready," when a drive is improperly connected or a diskette incorrectly loaded.

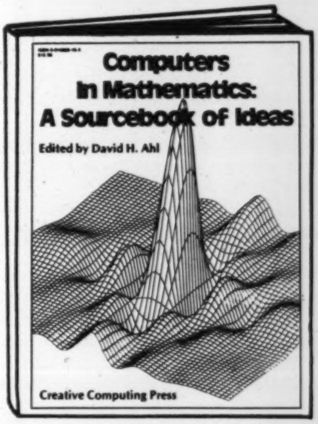
Or let's say you're playing one of the popular games in the Adventure series. In addition to your screen display, TNT will warn you orally of the evil mummy or clue you in on a few secrets of the Great Pyramid.

Vodex—a Division of Votrax Company, 500 Stephenson Hwy., Troy, MI 48084.☐

> *"The most gladsome thing in the world is that few of us fall very low; the saddest that, with such capabilities, we seldom rise high."*
>
> *Sir James Matthew Barrie*

Sourcebook of Ideas

Many mathematics ideas can be better illustrated with a computer than with a text book.


Computers in Mathematics: A Sourcebook of Ideas
Edited by David H. Ahl
Creative Computing Press

Consider Baseball cards. If there are 50 cards in a set, how many packs of bubble gum must be purchased to obtain a complete set of players? Many students will guess over 1 million packs yet on average it's only 329.

The formula to solve this problem is not easy. The computer simulation is. Yet you as a teacher probably don't have time to devise programs to illustrate concepts like this.

Between grades 1 and 12 there are 142 mathematical concepts in which the computer can play an important role. Things like arithmetic practice, X-Y coordinates, proving geometic theorems, probability, compounding and computation of pi by inscribed polygons.

Endorsed by NCTM

The National Council of Teachers of Mathematics has strongly endorsed the use of computers in the classroom. Unfortunately most textbooks have not yet responded to this endorsement and do not include programs or computer teaching techniques. You probably don't have the time to develop all these ideas either. What to do?

For the past six years, *Creative Computing* magazine has been running two or three articles per issue written by math teachers. These are classroom proven, tested ideas complete with flowcharts, programs and sample runs.

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So we took the most popular 134 articles and applications and reprinted them in a giant 224-page book called *Computers in Mathematics: A Sourcebook of Ideas.*

Ready-to-use-material

This book contains pragmatic, ready to use, classroom tested ideas on everything from simply binary counting to advanced techniques like multiple regression analysis and differential equations.

The book includes many activities that don't require a computer. And if you're considering expanding your computer facilities, you'll find a section on how to select a computer complete with an invaluable microcomputer comparison chart.

Another section presents over 250 problems, puzzles, and programming ideas, more than are found in most "problem collection" books.

Computers in Mathematics: A Sourcebook of Ideas is edited by David Ahl, one of the pioneers in computer education and the founder of *Creative Computing.*

The book is not cheap. It costs $15.95. However if you were to order just half of the back issues from which articles were drawn, they would cost you over $30.

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CIRCLE 350 ON READER SERVICE CARD

A Tale of Three DOSes

Stephen Kimmel

creative computing software evaluation

creative computing
SOFTWARE PROFILE

Name: NewDOS/80
Type: Disk Operating System
System: TRS-80 Model I, 32K, Disk Drive
Format: Disk
Language: Machine Language
Summary: Very popular DOS
Price: $149
Manufacturer:
Apparat
4401 S. Tamarac Pkwy.
Denver, CO 80237

This article has been growing ominously. It started out as a simple review of VTOS 4.0. Along the way I decided to compare it to NewDOS/80 and TRSDOS 2.3 since it seems that a review in a vacuum is relatively worthless. I should, perhaps preface this tale of terror and intrigue by telling you how I use my computer. My 32K computer is used principally for word processing, sometimes for games, and only occasionally for program development. I bought all of my equipment, including my one 5" disk drive at my local Radio Shack. Except for text storage and a few game programs I really have little use for a disk drive. You could say that I am a disk user only. I almost never program to the thing.

TRSDOS 2.3 et.al.

TRSDOS 2.3 is the operating system that came with my disk drive ($14.95 separately). It is well worth the price, which in my particular case was nothing. Being a cheapskate I had no plans to get anything else. TRSDOS 2.3 does *practically* everything I have any interest in doing and seems to do it very nicely thank you. TRSDOS offers the following commands. They may be considered as the "basic" set of DOS commands.

These will suffice if you aren't doing anything too fancy with your disk system. I have yet to run into any of the well-known problems in TRSDOS. Of course, that may be because I've never seen any of the earlier TRSDOSes. I am one of those operators who rigorously follows the prescribed procedures. So I have very little problem with the thing. I suppose you could say that I am a satisfied customer.

creative computing
SOFTWARE PROFILE

Name: TRSDOS 2.3
Type: Disk Operating System
System: TRS-80 Model I, 32K, Disk Drive
Format: Disk
Language: Machine Language
Summary: Standard Tandy DOS
Price: Free with disk drive, $14.95 separately
Manufacturer:
Tandy Corp.
One Tandy Center
Fort Worth, TX 76102

Note, however, that I said "practically." Even with my rather meager requirements, there were shortcomings in TRSDOS. At least half of what I bought a disk drive for was to load programs in seconds rather than minutes. The games I really like, the adventures, "Sargon," the Big Five arcade games, are machine language programs designed to run on a non-disk 16K computer "Adventure" takes up almost all of the free memory. So does TRSDOS. Tandy's answer to the problem of putting machine language on disk was their Tape-Disk utility, which only works if the program doesn't load in the lower half of memory. They add that they never promised me the system would work with somebody else's software, and yes it was a shame, but too bad, would I like to buy a copy of "Pyramid," no it won't load to disk either.

Enter NewDOS/80

Apparat, 4401 S. Tamarac Pkwy., Denver, CO 80237, had a different answer that was more to my liking, LMOFFSET, a utility program that comes with the NewDOS+ and NewDOS/80 packages ($149). My $325 disk drive didn't seem like such a bargain so I sold the car and bought the NewDOS/80 package.

LMOFFSET and SUPERZAP are practically worth the price of admission by themselves. I had new Disk commands and new Basic commands and was spinning my disks until the world was beginning to look level. But all was not bliss with NewDOS/80. To be perfectly honest I was intimidated by all of the NewDOS power. The thickness of the manual—at least an inch—should have warned me but it didn't. I'm afraid to try some of the commands. Those I use took quite a while to extract from the manual which is done in the finest IBM style. If you know what you're looking for you can find it.

The moral of this short tale is that Apparat isn't lying when they say, "It has been designed for the sophisticated user who demands the ultimate in disk operating systems." It is a powerful program. If all you want are the utilities and to avoid some of the TRSDOS deficiencies, then what you want is NewDOS+.

I eventually settled into a pattern of using the functions I could understand, acquiring a few more every so often and forgetting the rest. I suppose you could say that I was a satisfied customer. I would never consider forking out another $100 for another operating system.

VTOS 4.0

Then along comes a copy of VTOS 4.0

Stephen Kimmel, 4756 S. Irvington Place, Tulsa, OK 74135.

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  Directories can be expanded three times the normal number of available entries, even on DOS disks. This is extremely useful when using double density.
- **DYNAMICALLY MERGE IN BASIC**
  To allow sections of BASIC programs to be deleted and replaced with lines from a disk file during program execution. Also allows merging of non-ASC II format files.
- **SELECTIVE VARIABLE CLEARING**
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- **PAGE SCROLLING IN BASIC**
  Scrolling has been modified to allow the user to display programs page by page, in addition to the regular line scrolling.
- **REPEAT FUNCTIONS**
  Keys in MODEL I repeat when held down. Entering "R" as a DOS command causes the previous DOS command to be repeated.
- **ROUTING FOR DEVICE HANDLING**
  To send input and output from one device (display, printer, keyboard, etc.) to others or to a routine in main memory.
- **DISASSEMBLER OUTPUT TO DISK**
  The Disassembler will now write a source code file to disk, which the editor assembler can read and edit.
- **CHAINING ENHANCEMENTS**
  Features to allow chain files to be written from SCRIPSIT; also, chaining may be switched on and off without changing chain file positioning, and may be executed via CMD "xxx" and DOS-CALL.
- **SUPERZAP**
  has the ability to scan diskettes or disk files to find the occurences of specific values. Also will generate disk file passwords and hashcode.

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CIRCLE 182 ON READER SERVICE CARD

with a request to review it. Did I need a new DOS? No. Between TRSDOS and NewDOS I seemed to have everything. Did I care if VTOS 4.0 would support any conceivable combination of eight disk drives? I haven't figured out why I want two drives yet. Did I care that it would support high speed clocks, non-breakable Auto and Chain commands, had an all purpose spooler and had keyboard type ahead? No, I did not. Did I care that it was endorsed by Scott Adams and Lance Micklus? Lance who?

Did I care that it was 100% upward compatible with TRSDOS 2.3? Now you've got my attention. There are lots of programs out there that aren't quite compatible with NewDOS. Did I care that it was at least three times faster? Did I care that it would allow me to redefine the keys in a manner that puts TSHORT to shame? Do I care that it has dated and marked files? Yes. Yes. Yes. But was that worth another $100? Uhhhh.

A Brief Comparison

What I like best about VTOS 4.0 is the same thing I like least about NewDOS/80. VTOS 4.0 is extremely easy to use. Instead of giving me a 200-page manual, they include a 40-page operator's guide. That probably tells you everything you need to know if you're just an operator. If you're a programmer who needs to get down to the nitty gritty then you'll need the $30 Master Reference Manual, which is undoubtedly an inch thick and intimidating.

An example is in order. Consider the COPY command. The TRSDOS manual says:

"COPY filespec1 TO filespec2

Creates a duplicate of filespec1 under the newname filespec2. If filespec2 already exists, its previous contents are lost. The first file (filespec1) is unchanged by this command."

"You must have at least two disk drives to copy a file from one diskette to another.

"Example:

COPY PAGE7/TXT:0 TO PAGE7/TXT:1

duplicates PAGE7/TXT on drive 0 onto drive 1, using the same name/extension."

That seems pretty straight forward and simple. Now look at the entry from the VTOS operator's guide.

"COPY filespec/devspec (prep) filespec/devspec

"The COPY command will copy data from the first file or device to the second file or device. If the second specification is for a file, dynamic defaults will be used for the name, extension, and password. This will cause any of these fields which are not specified to be duplicated from the first file specification. Note that this does not apply to the drive number due to its global nature.

"Example: COPY TEST.SECRET/BAS /OLD

"If either specification is for a device, the copy will be performed on a character by character basis. Otherwise, the copy will be performed on a file basis using memory which is not otherwise used.

"The operation may be aborted at any time with the BREAK key if a character oriented, logical device, copy is being performed."

Once again, that seems relatively straightforward and simple. Taking it out of context may create a little difficulty, though. When it talks about copying to a device it simply means you can copy it to your screen or your printer or wherever you would like it to go.

Now consider the partial quote from the NewDOS/80 manual in Figure 1.

And on and on for five pages single-spaced trying to explain what all the options are. Each of the formats is used for something slightly different and many of the options are mutually exclusive, such as the ones to keep the old disk password while using this new one. I understand that Apparat has now issued a card-sized user's guide and I plan to get one.

The POWER!

It should be obvious that both VTOS 4.0 and NewDOS/80 offer significant enhancements on TRSDOS and hence offer more commands. This is a list of most of the added commands and a brief description of what each does. You begin to get a feeling for the added power of the systems from the list.

ALLOC (VTOS 4.0) preallocate a file in the fewest segments.

APPEND (VTOS 4.0 and NewDOS/80) append file 1 to the end of file 2.

BUILD (VTOS 4.0) keyboard line input direct to disk.

BOOT (VTOS 4.0 and NewDOS/80) reboot the system.

BREAK (NewDOS/80) Enable/disable the break key. (Done in VTOS 4.0 with the command SYSTEM (BREAK=OFF)).

CHAIN (NewDOS/80 and VTOS 4.0) shift to keyboard input from disk record.

HIMEM (NewDOS/80) Set DOS high memory value (VTOS 4.0-MEMORY).

FILTER (VTOS 4.0) ????? Something about a new I/O path with a filtering or massaging routine. I don't understand it at all.

LINK (VTOS 4.0) Link together input/output to/from logical I/O devices.

MDBORT/MDCOPY/MDRET (NewDOS/80) Special minidos versions.

PDRIVE (NewDOS/80) assign default attributes to a physical device. This can be done under VTOS 4.0 but I don't know how.

RESET (VTOS 4.0) reset a specified logical device.

ROUTE (VTOS 4.0) creates and/or reroutes I/O for one device to a different device, a disk file or a bit bucket.

SET (VTOS 4.0) establish a new logical I/O device.

XFER (VTOS 4.0) copy between two disks neither of which has the system. (Done in NewDOS/80 with Copy format 4.)

And, of course, the added commands are only a portion of what an enhanced DOS will do for you. Both VTOS 4 and NewDOS/80 offer assorted utility programs.

Continued on pg. 158.

```
2.10 COPY

The COPY command is used to copy a single file, multiple files
or a full diskette. COPY has 6 formats:
     1. COPY,filespecl<,TO>,filespec2
     2. COPY,$filespecl<,TO>,filespec2
     3. COPY,<:>dnl,filespecl<,TO>,filespec2
     4. COPY,<:>dnl,$filespecl<,TO>,filespec2
     5. COPY,<:>dnl<=tcl><,TO>,<:>dn2<=tc2>,mm/dd/yy<,Y>
             <,N><,NDMW><,NFMT><,SPW=passwordl>
             <,NDPW=password3><,DDND><,ODN=namel><,KDN>
             <,KDD><,NDN=name2><,SN=name3><,USD><,BDU><,UBB>
     6. COPY,<:>dnl<=tcl><,TO>,<:>dn2<=tc2>,mm/dd/yy,CBF<,CFWO>
             <,Y><,N><,NDMW><,NFMT><,SPW=passwordl>
             <,ODPW=password2><,NDPW=password3><,DDND>
             <,ODN=namel><,KDN><,KDD><,NDN=name2><,SN=name3>
             <,USD><,UBB><,DDST=tnl><DDGA=gcl>
COPY cannot be executed under MINI-DOS. However DOS library
command MDCOPY is available.

Filespecl is the source file's filespec. Filespec2 is the
destination file's filespec. dnl and dn2 are drive #'s and may
be equal. The colon preceding dnl and/or dn2 is optional.
Remember, keyword TO is optional, and commas may be replaced by
spaces.
```

Figure 1.

CRAE 2.0

A FAST CO-RESIDENT APPLESOFT EDITOR FOR APPLESOFT PROGRAMERS, NOW PERFORM GLOBAL **CHANGES/FINDS** TO ANYTHING IN YOUR PROGRAM. OTHER COMMANDS INCLUDE: RENUMBER, APPEND, QUOTE (COPY), LIST (OPTIMIZED), MODIFY (SINGLE LINE), AUTO LINE NUMBERING, FORMATTED MEMORY DUMP, HEX/DEC CONVERSION, FREE SPACE, AND ABILITY TO ENTER MONITOR COMMANDS. CRAE 2.0 IS COMPATIBLE WITH NEIL KONZEN'S PROGRAM LINE EDITOR, REQUIRES 48K RAM APPLESOFT ROM AND DISK.

……

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Then There Was LDOS

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SOFTWARE PROFILE

Name: LDOS
Type: Disk Operating System
System: TRS-80 Model I, 32K, Disk Drive
Format: Disk
Language: Machine Language
Summary: Excellent DOS
Price: $139.95
Manufacturer:
Lobo International
935 Camino Del Sur
Goleta, CA 93017

VTOS has been replaced by LDOS. The replacement was not official, rather Randy Cook, the programmer of VTOS, sold marketing rights to Lobo International, and Lobo hired outside programmers to clean up the remaining problems and write a manual. Since VTOS does not have the same level of support, the distributors of VTOS have switched to LDOS.

Lobo International has done a marvelous job. The program works, there is a nice thick manual, and now purchasers have a place to turn with problems and questions.

LDOS is a great disk operating system for programmers. Stephen Kimmel, in the preceding article, recommends that serious disk users get either NewDOS or VTOS (LDOS), but does not know which one to recommend. For me, there is no question. If you simply use a disk operating system to run programs written by others, NewDOS is the system for you. It is faster and much easier to learn and use. In fact, I recommend NewDOS over NewDOS/80 unless you have a program that uses a specific new feature of NewDOS/80, for NewDOS/80 has compatibility problems with other disk operating systems. LDOS sometimes has problems reading NewDOS/80 files.

However, if you are a serious programmer, you should have LDOS. I personally do my development work with LDOS, then transfer the finished product to NewDOS for regular use.

LDOS is compatible with both TRSDOS (Tandy Radio Shack Disk Operating System) and NewDOS, including such popular features of NewDOS as the ability to append to a sequential file and call the directory from a Basic program.

In addition, LDOS adds several features that are not present in NewDOS. These features include switchable (on/off) type ahead, lower case driver, blinking cursor, and key stroke multiplier routines. Type ahead allows you to keep typing even if you are ahead of your program. It is great with Electric Pencil, for it keeps you from dropping characters at the end of every line if you are a fast typist.

The key stroke multiplier allows you to define a command or even a whole phrase for each of the 26 letter keys on the keyboard. Then, if you hold the clear key and press that letter, the whole phrase appears on the screen. For example, I often use the up arrow (ASCII code 91) to get me to the menu from any point in the program. If I had my input routine at line 10 and my menu at line 200, I could define the I key to produce:

```
GOSUB 10:IF ASC(RIGHT$(I$,1))=91
THEN 200
```

If I used the same phrase thirty times in my program, I would only have to hit **CLEAR I** each time to type it in.

Even without the key stroke multiplier activated it is possible to generate control codes and graphics characters directly from the keyboard, a feature that can be very handy in writing or modifying programs.

The directory in LDOS has some features that are very useful to programmers. For example, every time you save a file, the computer records the date. In addition, every time a file is changed or modified, the directory entry adds a plus sign to the end of the file name to indicate that the file has not been backed up. When you make a backup copy, the plus sign is automatically removed unless the disk is write protected. LDOS even has a special BACKUP feature that allows you to back up only files that have been modified. For example, if you type:

```
BACKUP :2 TO :3(MOD)
```

LDOS will copy all modified files in drive 2 to drive 3, and change the modification flags on the diskette in drive 2 to show that the files have been backed up.

The LDOS PURGE command is very convenient. It simply displays every file on the disk, one at a time, and asks you to press Y if you wish to delete it from the diskette or N if you wish to keep it.

For the skilled programmer, LDOS offers a Job Control Language which allows many operations to be performed automatically at the operating system level. This combines with the ability to route device drivers (For example, sending all printer output to a disk file instead of or in addition to the printer) to offer some powerful abilities. A single line of many in a job control language file might read:

```
SET *CL to RS232 (WORD=7,
STOP=2,PARITY,EVEN,BAUD=
450,DTR)
```

This would set up LCOMM (The LDOS communications package) for you. If you put these instructions in a JCL file called SETCL, then you could simply type:

```
DO=SETCL
```

to configure the communications package.

LCOMM is a very powerful utility. It offers the features of a smart terminal package selling for as much as LDOS, and is included at no extra charge. You can use it to communicate with a timesharing computer or computer bulletin board, or even to transfer ASCII files from one computer to another.

LDOS allows you to configure your system to handle mixed disk drive configurations. With the Radio Shack expansion interface, it will only handle 5 1/4" drives, but with the Lobo expansion interface, you can mix up to eight different drives, either 8" or 5 1/4" hard or floppy disk drives. For each drive you can specify the size of the drive, the number of tracks, single or double density, single or double sided, the stepping rate and the write delay. Let me see...I'll put a 35 track Radio Shack Drive on as drive 0, drive 1 will be a double density 77 track Percom, drive 2 will be a double sided double density Micropolis, drives 3, 4, and 5 will be 8" single density drives, and the other two will be 8" double density! Of course, I might have trouble backing up a double density, double sided 8" drive to a 35 track single density 5 1/4" drive, but the program will do it, prompting you to keep changing diskettes.

It would take at least 30 pages of review just to describe all the features of LDOS. The ones I have selected may not even be the most important; just the ones that appealed to me.—*George Blank*. □

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See full page of Apple products elsewhere in this magazine.

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Three DOSes, continued...

Again, here is a list of the programs and a brief description of what they will do for you. These are accessed by simply typing the name of the program. The difference between a utility and a command is sometimes a very subtle one.

BACKUP (VTOS 4.0 and TRSDOS 2.3) duplicate a diskette (NewDOS/80 uses the COPY command)

FORMAT (VTOS 4.0 NewDOS/80, and TRSDOS 2.3) prepare a data diskette.

SPOOL (VTOS 4.0) ASPOOL (NewDOS/80) print out while computing something else.

PATCH (VTOS 4.0) SUPERZAP (NewDOS/80) edit portions of memory or disk files. Of the two, SUPERZAP appears to be the more powerful.

KSR/CMD (VTOS 4.0) emulate a keyboard send-receive terminal.

VTCOMM/CMD (VTOS 4.0) more advanced communications package.

PR/DVR (VTOS 4.0) generalized printer driver to use special printers with the system.

RS232/DVR (VTOS 4.0) driver for a RS232 interface device.

KSM/DVR (VTOS 4.0) redefine the keys to anything you like.

DISASSEM (NewDOS/80) disassemble Z-80 code.

LMOFFSET (NewDOS/80) Load a module in an offset location and add a reloader. This is how you load machine language programs.

DIRCHECK (NewDOS/80) Inspect the directory for errors.

EDTASM (NewDOS/80) Disk oriented editor assembler.

LEVEL1 (NewDOS/80) Level I Basic in Level II.

LV1DSKSL (NewDOS/80) Save and Load Level I programs on disk.

Finally, enhanced DOSes almost always enhance Disk Basic. Both VTOS and NewDOS/80 support all of the functions of the TRSDOS Basic. Both add new features. Both NewDOS/80 and VTOS 4.0 permit you to execute essentially any DOS command from within Basic using the CMD command. Both offer protection of Basic programs. Both offer the ability to display cross-reference tables for line numbers and variables. Both enhance the TRSDOS 2.3 renumber utility. Under TRSDOS 2.3 you could start a renumber any place you like and the program would renumber to the end. Under VTOS 4.0 you do the same but you can stop anywhere you like so long as it doesn't result in changing the order of the statements. Under NewDOS/80 you can start and stop anywhere you like and rearrange the lines. In fact NewDOS/80 offers two additional commands to move line numbers around.

Both permit easy access to variable length files. This can be done under TRSDOS but it is awkward. NewDOS/80 also offers a batch of new file structures: FI, a fixed item file not record segmented; FF, a fixed item file of fixed record lengths; MI, a marked item file not segmented into records; MU, a marked item file segmented into records of varying lengths; and MF, a marked item file segmented into fixed record lengths. I'll be honest. I don't understand any of the new NewDOS/80 file structures and won't try to tell you anything more.

The Final Evasion

Who can say which DOS is the better package? VTOS 4.0 is easier to use, and is 100% upward compatible with TRSDOS, and has all those communications drivers. NewDOS/80 may be more powerful and its utilities are more oriented toward what I'm doing with my machine. Of course, you'll have to decide which group of functions better fits your needs. Currently, I'm using VTOS 4.0 for all of the TRSDOS programs, and NewDOS for all of the machine language programs including Scripsit. What little program development work I do on NewDOS. Both systems are fine enhancements and I advise any serious disk user to get one—but I won't tell you which one. □

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HARD DISK DRIVE & CONTROLLER $5995. Second User $595.
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BASIC CROSS REFERENCE UTILITY (Mod II 64K) **$50.00**
SEEK and FIND functions for Variables, Line Numbers, Strings, Keywords. 'All' options available for line numbers and variables. Load from BASIC — Call with 'CTRL'R. Output to screen or printer!

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(Mod I Min 32K 2-drive system. Mod II 64K 1-drive. Mod III 32K 1-drive)

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DISCAT (32K 1-drive Min) **Mod I, III $50.00**
This comprehensive Diskette Cataloguing/Indexing utility allows the user to keep track of thousands of programs in a categorized library. Machine language program works with all TRSDOS and NEWDOS versions. Files include program names and extensions, program length, diskette numbers, front and back, and diskette free space.

KFS-80 (1-drive 32K Min — Mod II 64K) **Mod I, III $100.00; Mod II $175.00**
The keyed file system provides keyed and sequential access to multiple files. Provides the programmer with a powerful disk handling facility for development of data base applications. Binary tree index system provides rapid access to file records.

MAILLIST (1-drive 32K Min - Mod II 64K) **Mod I, III $75.00; Mod II $150.00**
This ISAM-based maillist minimizes disk access times. Four keys — no separate sorting. Supports 9-digit zip code and 3-digit state code. Up to 30 attributes. Mask and query selection. Record access times under 4 seconds!!

COMPROC (Mod I & Mod III — Disk only) **Mod I $20; Mod III $30**
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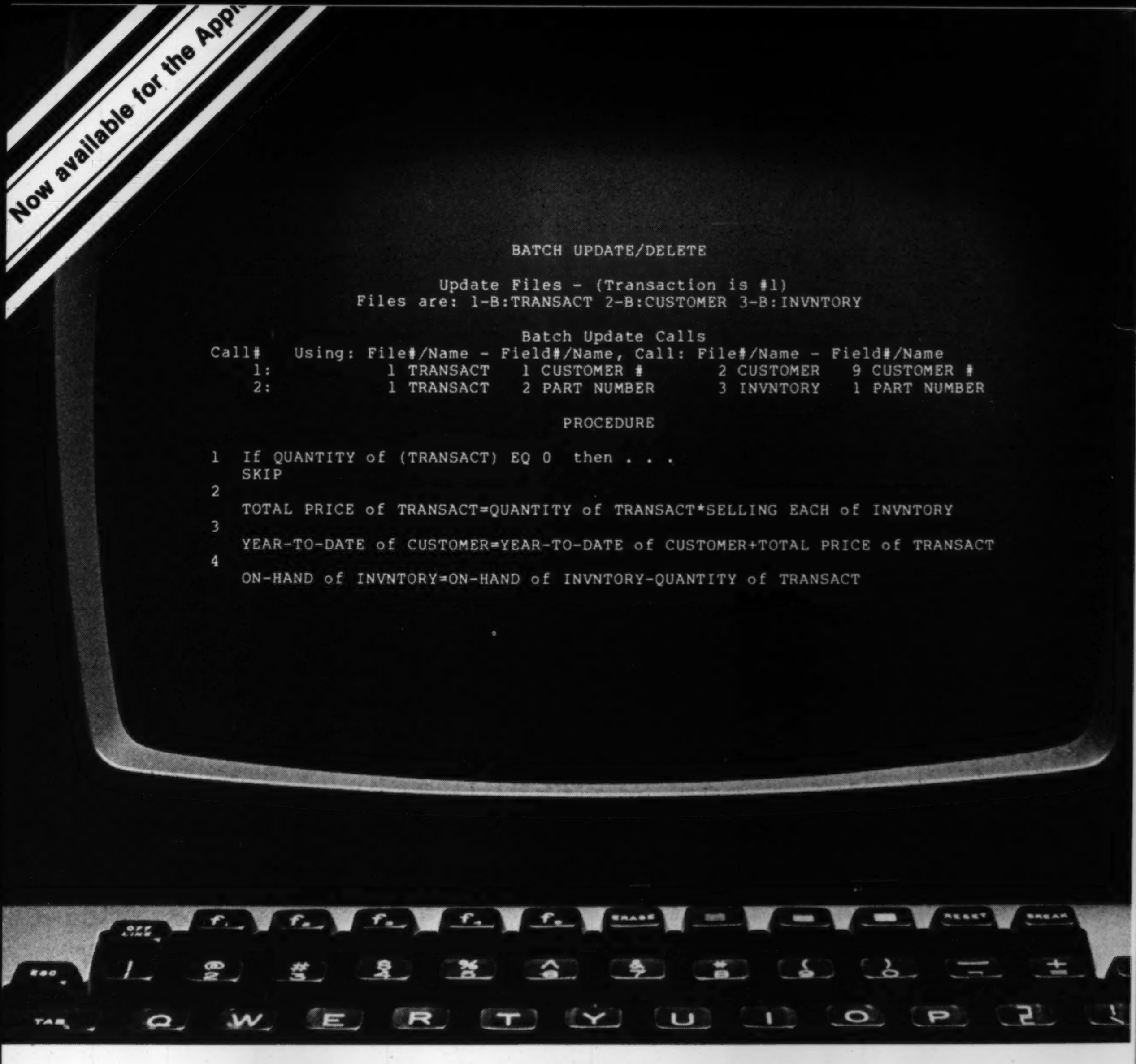

```
                         BATCH UPDATE/DELETE

                  Update Files - (Transaction is #1)
          Files are: 1-B:TRANSACT 2-B:CUSTOMER 3-B:INVNTORY

                          Batch Update Calls
Call#   Using: File#/Name - Field#/Name, Call: File#/Name - Field#/Name
   1:            1 TRANSACT   1 CUSTOMER #        2 CUSTOMER   9 CUSTOMER #
   2:            1 TRANSACT   2 PART NUMBER       3 INVNTORY   1 PART NUMBER

                              PROCEDURE

1   If QUANTITY of (TRANSACT) EQ 0  then . . .
    SKIP
2
    TOTAL PRICE of TRANSACT=QUANTITY of TRANSACT*SELLING EACH of INVNTORY
3
    YEAR-TO-DATE of CUSTOMER=YEAR-TO-DATE of CUSTOMER+TOTAL PRICE of TRANSACT
4
    ON-HAND of INVNTORY=ON-HAND of INVNTORY-QUANTITY of TRANSACT
```

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Programming Aids 3.3 and Disk Fixer

Apple Disk Utilities

David Lubar

The Apple disk operating system (DOS) is, of course, useful for storing and retrieving programs, but this is just the leading edge of its abilities. One can also access and change disk data at the byte level. Such operations are useful in many ways. Unfortunately, Apple DOS by itself doesn't contain the full set of commands and utilities required for these manipulations. To fill the void, several programs have appeared which allow the user to read, edit, and write disk sectors. Two such programs are discussed below. One is specifically designed for working just with disk data, while the other includes a wealth of added functions.

creative computing
SOFTWARE PROFILE
Name: Programming Aids 3.3
Type: Utility
System: 48K Apple II, Rom Applesoft, Disk Drive
Format: DOS 3.3 Disk
Language: Applesoft and Machine Language
Summary: A complete set of utilities for the serious programmer
Price: $90
Manufacturer:
Dakin5 Corp.
P.O. Box 21187
Denver, CO 80221

Dakin's Dozen

The *Dakin5 Programming Aids 3.3* is the Cadillac of disk utilities. It contains just about every utility the serious programmer might need. Let's take the routines in the order in which they appear in the menu. The Lister allows you to configure listings specifically for your printer. You can specify line length and page length. If desired, page numbers will be added. The list is headed with the program name, the date and title. The program is smart enough to reject bad data such as a time entry containing more than 59 minutes. The last date used is stored on the disk and is kept as a default value. It can be changed at any time. The Lister can handle both full and partial listings.

Line Cross Reference produces a list of all referenced lines. The information can be sent to the printer or the screen. Another nice feature is revealed when you use this program. A message is placed at the top of the screen telling you how to load a program and then give a CALL to run the cross reference. This message is protected since the program lowers the top of the scroll window. You can get a catalog, list to the screen, or do anything else that causes scrolling without losing the message. During execution, a keypress halts the display, allowing users without printers a chance to see the information. The Variable Reference program functions in a similar manner, producing a list of all variables and the lines where they occur.

The Peeker is a handy program that prints the contents of random access files. Either an entire file or just a partial series of records can be printed or sent to the screen.

The Patcher is used for reading, editing, and writing disk sectors. You can specify a specific track and sector, or enter a file name. If a file name is entered, the program moves sequentially through sectors containing that file. If a specific sector is requested, only that one is displayed. After any changes are made the program asks for the next track and sector number. Changes can be entered either as hex code, ASCII data with the hi bit off, or ASCII data with the hi bit on. Changes are entered by giving the relative address of the byte within the sector, followed by the desired data. A single byte or series can be changed at any time. The changes are sent to disk unless escape is pressed. While this method works well enough, it is not the easiest way to edit sectors, and is best used for making minor changes.

The Copier program is similar to FID, which comes with Apple DOS 3.3. Copier allows you to copy files, using two drives, but doesn't allow wild cards in file names, or offer any of the other extras that come with FID. Diskette Copy is a dual-drive copy program that initializes the destination disk and verifies all files. It also allows you to initialize a disk without placing DOS on it. These two programs are nice additions to the package, but don't really offer anything special.

The Array Editor creates and edits text files. Any sequential text file with fewer than 91 characters per record and fewer than 201 records can be manipulated with this utility. The most obvious use for this would be to create EXEC files. It could also be handy for correcting errors in files created by Basic programs or for fixing partially clobbered files.

The calculator is a machine-language subroutine for doing addition, subtraction, multiplication and division with twenty-place accuracy. To use the Calculator with Basic programs, you BLOAD it and set HIMEM to 36864. The numbers used in the operation must be stored as strings, with no non-numeric characters. Thus, only integers can be passed since decimal

** DAKIN5 PROGRAMMING AIDS 3.3 MENU **
TODAY'S DATE 05/19/80
THE LISTER
ENTER YOUR SELECTION ->
disk II
disk II
DAKIN5
Programming Aids 3.3
12
12-in-1 Utility Kit

Find Your Way Around The New Apple® DOS With The Dakin5® Programming Aids 3.3©

Dakin5 Corporation, a Colorado software house, is making available to the public 12 utility programs on one 16 sector diskette, utilizing the new Apple DOS 3.3, which provides 23% more storage.

These menu-driven utilities will facilitate the development of your own microcomputer programs.

All of the **Dakin5 Programming Aids 3.3** programs are also compatible with the Corvus Disk Drive system.

This 12-in-1 set of utility programs accomplishes the following:

The Lister sends BASIC programs to the printer to be listed, utilizing the full line capacity of the printer. Pagination and page headings, including program name and date, are also provided as additional options.

The Line Cross Reference produces a display or a printed listing of all lines referenced by GOTO, THEN, GOSUB, LIST or RUN statements in an Applesoft BASIC program. Cross-referencing of most programs is done in a few seconds. An option allows you to print only the line numbers referenced in GOSUB statements.

The Variable Cross Reference creates a display or a printed listing of all variable names used in an Applesoft BASIC program, showing all line numbers where a given variable name is used.

The Peeker displays or prints either all or selected records from a text file.

The Patcher allows you to display any sector of a given file or program, and then to update any data within that sector. Another option permits you to specify the sector you wish to update such as directory sectors and sectors occupied by DOS.

The Copier copies absolutely ANY type of file or program on a normally formatted diskette from one diskette to another. The name of the program or file is the ONLY information needed.

The Calculator adds, subtracts, multiplies and divides very large numbers using numeric string data. The Calculator subroutine (using twenty place accuracy) is written in Assembler code, and runs much faster than an equivalent BASIC subroutine.

The Diskette Copy is a diskette-to-diskette copy program that does more than just copy. First, the program verifies the input. Then it formats an output disk, copies each track, and checks that the output matches the input. Additional options allow you to either initialize a diskette without DOS, or to create a copy without DOS, thereby increasing storage by 32 sectors. You may even create a copy with a different volume number than the original.

The Array Editor is a simple word processor that allows you to create, modify, print and save your own text or EXEC files.

The Screen Printer permits contents of the text screen to be sent to the printer at any time the keyboard is active (i.e. the cursor is visible). This Screen Printer program remains in effect until you press RESET or "reboot" the system.

The Prompter is a data entry subroutine that handles both string and numeric data. You have the option of using commas, decimal points and leading zeros with right-justified numerics. Alphanumeric data is left justified with trailing spaces added as required. With the Prompter you are also able to specify maximum field length to prevent overflow in both numeric and alphanumeric fields. You can even define your own set of valid characters.

The Cruncher removes REM statements, unreferenced (dead) code, and compresses code in Applesoft programs. This will increase the speed of your programs; memory and disk space savings could be more than 45%.

Many of these utility programs have been developed and tested for in-house use while producing The Controller™ business package for Apple Computer Inc.

Each programming aids package includes a program diskette and very complete documentation, all attractively packaged in a padded, blue print vinyl 3-hole notebook with silver lettering. An identifying tab separates each program for convenient reference.

See your Apple dealer or contact
Dakin5 Corporation, P.O. Box 21187,
Denver, Colorado 80221. Telephone:
800-525-0463. Visa or MC welcome.

DAKIN5
CORPORATION

Apple is a registered trademark of Apple Computer Inc.

The Controller is a registered trademark of Dakin5 Corporation.

CIRCLE 125 ON READER SERVICE CARD

points are not allowed. The required routine is CALLed from Basic, and executes very quickly. On return, the answer is stored as a string. If there is a remainder in a division problem, it is stored in a separate string. Though applications requiring floating-point answers will require extra work on the programmer's part, the Calculator routine can be very helpful to anyone who needs high precision arithmetic at high speeds. If the user commits an error in defining the operation, the program doesn't bomb, but returns to Basic. A location can be PEEKed to obtain the error code.

The next utility is one about which Apple should have thought when they were designing the computer. It's called the Screen Printer, and it dumps the text screen to a printer. The code for this sits in page 3 of RAM, out of the way of most programs. Printout is obtained by hitting Control-Z whenever the keyboard is active. This routine was used to obtain hard copy of the sector display shown in Figure 1. Anyone who has ever tried to obtain a sample run of a program that doesn't print sequentially to the screen can appreciate the value of this routine.

The Prompter is another program which is designed to be used as a subroutine. It allows you to specify the format and restrictions of data received through INPUT statements. Among other things, it allows default values to be specified, prints optional commas and leading zeroes in numeric input, and allows special user-defined input restrictions as well as restrictions on length of input. Users wishing to incorporate Dakin5 subroutines in their own commercial software should contact the company about licensing.

Finally, we have the Cruncher. This powerful tool compresses Applesoft programs, removing unneeded spaces, deleting unreferenced REMs, and removing the comments from referenced REMs. After running the Cruncher, you load a program and give a call to the monitor. A Geiger-counter sound comes from the Apple speaker; the longer it clicks, the more the program is being crunched. Not only will crunched programs take up less space, they will run faster than uncompressed versions. The routine works quickly, and produced a substantial reduction in the programs on which it was tested.

The Dakin5 Programming Aids 3.3 is the Cadillac of disk utilities.

The entire Dakin5 package shows evidence of much thought and care. The instructions, packaged in a ring binder, are thorough and understandable. Anyone involved in software development should be able to get a great deal of mileage from this disk.

creative computing
SOFTWARE PROFILE

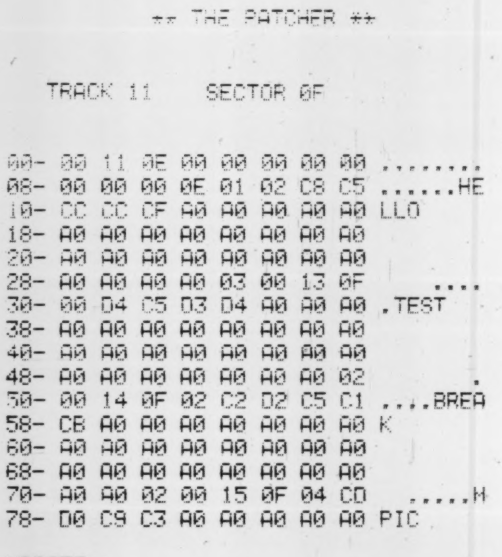
Name: Disk Fixer
Type: Utility
System: 32K Apple II, Disk Drive
Format: DOS 3.2 Disk (can be muffinned to 3.3)
Language: Machine Language
Summary: Excellent read/write program for disks.
Price: $29.95
Manufacturer:
Image Computer Products, Inc.
615 Academe Dr.
Northbrook, IL 60062

The Image of Perfection

Disk Fixer is designed solely for reading and editing disk sectors, but it does a superb job. The program, which can handle any flavor of DOS from 3.2 up, combines sector display with powerful screen editing capabilities, making it easy to use and extremely versatile. So many functions are provided that they can't all be covered here.

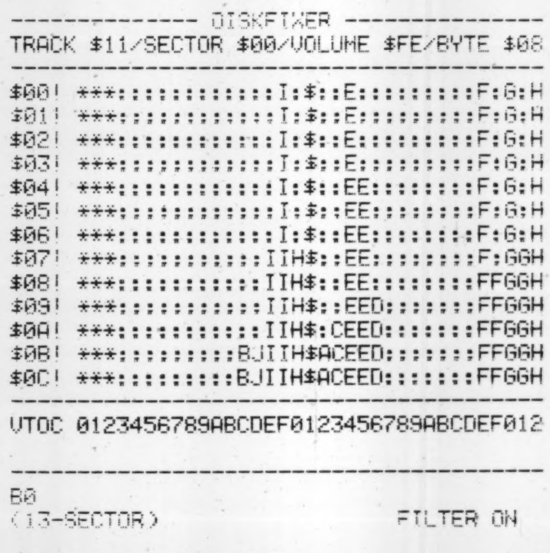
Basically, you start most operations by pulling a sector into the main buffer. This is done using the R command (for Read a sector). The current track and sector are listed at the top of the screen. When you hit R, the cursor moves up to these

Figure 1. A directory sector displayed by the 20 Patcher.



```
            ** THE PATCHER **


   TRACK 11    SECTOR 0F


00- 00 11 0E 00 00 00 00 00 ........
08- 00 00 00 0E 01 02 C8 C5 ......HE
10- CC CC CF A0 A0 A0 A0 A0 LLO
18- A0 A0 A0 A0 A0 A0 A0 A0
20- A0 A0 A0 A0 A0 A0 A0 A0
28- A0 A0 A0 A0 03 00 13 0F     ....
30- 00 D4 C5 D3 D4 A0 A0 A0 .TEST
38- A0 A0 A0 A0 A0 A0 A0 A0
40- A0 A0 A0 A0 A0 A0 A0 A0
48- A0 A0 A0 A0 A0 A0 A0 02        .
50- 00 14 0F 02 C2 D2 C5 C1 ....BREA
58- CB A0 A0 A0 A0 A0 A0 A0 K
60- A0 A0 A0 A0 A0 A0 A0 A0
68- A0 A0 A0 A0 A0 A0 A0 A0
70- A0 A0 02 00 15 0F 04 CD   .....M
78- D0 C9 C3 A0 A0 A0 A0 A0 PIC

UPDATE :
```

Figure 2. VTOC map from Disk Fixer.



```
-------------- DISKFIXER ---------------
TRACK $11/SECTOR $00/VOLUME $FE/BYTE $08
----------------------------------------
$00! ***::::::::::::I:$::E:::::::::F:G:H
$01! ***::::::::::::I:$::E:::::::::F:G:H
$02! ***::::::::::::I:$::E:::::::::F:G:H
$03! ***::::::::::::I:$::E:::::::::F:G:H
$04! ***::::::::::::I:$::EE::::::::F:G:H
$05! ***::::::::::::I:$::EE::::::::F:G:H
$06! ***::::::::::::I:$::EE::::::::F:G:H
$07! ***:::::::::::IIH$::EE::::::::F:GGH
$08! ***:::::::::::IIH$::EE::::::::FFGGH
$09! ***:::::::::::IIH$::EED:::::::FFGGH
$0A! ***:::::::::::IIH$:CEED:::::::FFGGH
$0B! ***:::::::::BJIIH$ACEED:::::::FFGGH
$0C! ***:::::::::BJIIH$ACEED:::::::FFGGH
----------------------------------------
VTOC 0123456789ABCDEF0123456789ABCDEF012

----------------------------------------
B0
(13-SECTOR)                    FILTER ON

PRESS SPACE TO CONTINUE...             #
```

48K Apple II*or Apple II plus*

Time Manager™

Personal Information & Organization System

by Dick Ainsworth, Al Baker and Jeffrey P. Garbers

The most important program you will ever use with your Apple II* computer.

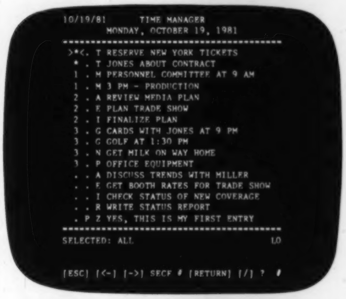
*Apple II and Apple II plus are trademarks of Apple Computer, Inc.

TIME SAVER

When you use Time Manager as your personal calendar, you create an automatic reminder and a permanent history file. By recording events as they happen, you can later retrieve a breakdown of time and expenses with a few keystrokes. You can easily organize and update all data, then create totals in several different categories for tax verification, expense reports and project evaluations.

DAILY ORGANIZER

Time Manager automatically provides a complete list of each day's activities, organized by priority. As you complete each item on your list, you can delete it or add it to your permanent records. Items scheduled but not completed become automatic reminders that head your list on the following day.



```
10/19/81      TIME MANAGER
        MONDAY, OCTOBER 19, 1981
----------------------------------------
 >*<. T RESERVE NEW YORK TICKETS
   * . T JONES ABOUT CONTRACT
   1 . M PERSONNEL COMMITTEE AT 9 AM
   1 . M 3 PM - PRODUCTION
   2 . A REVIEW MEDIA PLAN
   2 . E PLAN TRADE SHOW
   2 . I FINALIZE PLAN
   3 . G CARDS WITH JONES AT 9 PM
   3 . G GOLF AT 1:30 PM
   3 . N GET MILK ON WAY HOME
   3 . P OFFICE EQUIPMENT
   . . A DISCUSS TRENDS WITH MILLER
   . . E GET BOOTH RATES FOR TRADE SHOW
   . . I CHECK STATUS OF NEW COVERAGE
   . . R WRITE STATUS REPORT
   . P Z YES, THIS IS MY FIRST ENTRY
----------------------------------------
SELECTED: ALL                         LO

[ESC] [<-] [->] SECF # [RETURN] [/] ?  #
```

MONEY SAVER

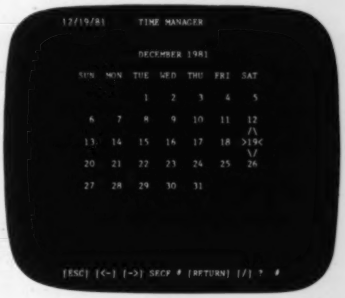
At tax time, the search and print features let you easily document expenses by category. If you itemize your business expenses and other deductions, this program could easily pay for itself in tax savings. Time Manager creates and totals expense records automatically by scanning your history for any category or keyword. With expenses linked to specific events, identification and verification are much easier.

EXECUTIVE DIARY

Time Manager's searching feature gives you immediate access to any past information. Documentation of important dates and events is automatic, as you enter them in your calendar or mark them as complete. By selecting a keyword or category, you can search through time and locate the exact date you made a particular phone call or paid your income tax.

APPOINTMENTS ALARM

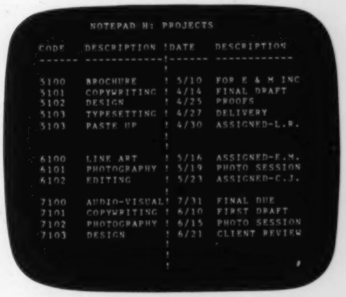
If your Apple II is equipped with a hardware clock, Time Manager displays the time and date. You can also set the buzzer for any time during the day to remind you of an important meeting or to help you conclude those that go on too long.



```
12/19/81     TIME MANAGER

             DECEMBER 1981

  SUN  MON  TUE  WED  THU  FRI  SAT

             1    2    3    4    5

   6    7    8    9   10   11   12
                                 /\
  13   14   15   16   17   18  >19<
                                 \/
  20   21   22   23   24   25   26

  27   28   29   30   31



[ESC] [<-] [->] SECF # [RETURN] [/] ?  #
```

PROJECTS COORDINATOR

Time Manager's category and keyword selection modes enable you to establish an infinite number of project titles or job numbers. After entering the information once, you can use cross reference searching to review all aspects of each project. This helps you keep track of schedules, employees, hours, dollars and deadlines. Time Manager gives you the power to see your data in any selection mode you choose, and get a printed update.



```
        NOTEPAD H: PROJECTS

CODE   DESCRIPTION !DATE   DESCRIPTION
------ ------------!------ ------------
                   !
5100   BROCHURE    ! 5/10  FOR E & M INC
5101   COPYWRITING ! 4/14  FINAL DRAFT
5102   DESIGN      ! 4/25  PROOFS
5103   TYPESETTING ! 4/27  DELIVERY
5103   PASTE UP    ! 4/30  ASSIGNED-L.R.
                   !
                   !
6100   LINE ART    ! 5/16  ASSIGNED-E.M.
6101   PHOTOGRAPHY ! 5/19  PHOTO SESSION
6102   EDITING     ! 5/23  ASSIGNED-C.J.
                   !
7100   AUDIO-VISUAL! 7/31  FINAL DUE
7101   COPYWRITING ! 6/10  FIRST DRAFT
7102   PHOTOGRAPHY ! 6/15  PHOTO SESSION
7103   DESIGN      ! 6/21  CLIENT REVIEW
                   !
                   !
                   !                  #
```

PORTABLE SECRETARY

In addition to the live data display, Time Manager and printer combine to give you hard copy records in seconds. If you are going to be away from your desk, for example, you might print a schedule of daily activities to take with you. You can also use Time Manager to create printouts of meeting agendas, project summaries and specialized lists.

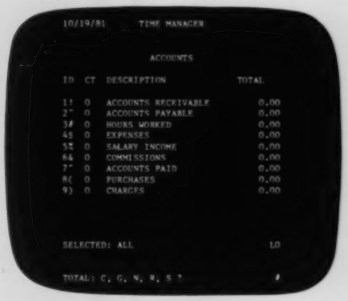
CIRCLE 261 ON READER SERVICE CARD

PERMANENT HISTORY

As each year ends, you will use Time Manager to create a new data diskette and save the previous one as your history file. Information you had labelled "permanent" is automatically transferred to your new calendar. Your complete history file may be accessed for any totals, summaries, evaluations and reports.

FINANCIAL ASSISTANT

Time Manager keeps track of any numerical data you record in your daily entries, including expenses and the number of hours worked. If you wish, you can set up several accounts and use them in combination with 26 different categories to create financial summaries. Then, with a single keystroke, create itemized invoices, billing records and internal accounting reports.



```
10/19/81     TIME MANAGER


                ACCOUNTS

ID  CT  DESCRIPTION              TOTAL

1!  0   ACCOUNTS RECEIVABLE       0.00
2"  0   ACCOUNTS PAYABLE          0.00
3#  0   HOURS WORKED              0.00
4$  0   EXPENSES                  0.00
5%  0   SALARY INCOME             0.00
6&  0   COMMISSIONS               0.00
7'  0   ACCOUNTS PAID             0.00
8(  0   PURCHASES                 0.00
9)  0   CHARGES                   0.00



SELECTED: ALL                       LO


TOTAL: C, G, N, R, S ?               #
```

DATA SEARCH

With appointments, meetings and social events already recorded in your calendar, it's easy to use Time Manager to locate any item. Information concerning people, projects, events and companies is readily available with a few simple commands. Specify a company, name or project title and Time Manager displays only those entries containing your selected word.

THIS DISK PROGRAM REQUIRES A SINGLE DISK DRIVE, 48K MEMORY

©Copyright 1980 The Image Producers, Inc.

IMAGE
COMPUTER PRODUCTS, INC

Available from your authorized Apple dealer.

numbers, which are changed merely by typing the new track and sector. The sector is brought into the main buffer and also into the edit buffer, which appears on the screen. All changes are made to the edit buffer. You move through the screen using the I, J, K, and M keys. There are also commands to move to the top of the screen or to any specified byte. Other keys allow you to bring in the next sector. The display offers many options. You can have a half sector displayed in hex with ASCII equivalents on the side, a full sector in hex, or a full sector in ASCII. There is a filter which can be used to mask the hi bit of ASCII displays. Numbers can be entered in either hex or decimal.

While this alone would constitute a full utility, Image Computer Products provides much more. There are special commands to view and manipulate the disk catalog. You can change filenames, sort files, or scan through all sectors of a specific file. When requesting files, Disk Fixer allows the wildcard entries found in FID.

Another set of routines manipulates the volume table of contents (VTOC). When the VTOC is accessed, Disk Fixer provides a display of free and used sectors on the disk. Beyond this, it can map the VTOC, displaying not only the sectors in use, but also showing which programs occupy which sectors. An example of this is shown in Figure 2. Another command fixes any errors in the VTOC, locking out sectors that are in use but marked as free in the bit map and freeing locked sectors that aren't in use.

There are special commands to view and manipulate the disk catalog.

A set of special commands is included for various functions. Any display can be sent to the printer using Control-P. You can switch between 13 and 16 sector disks with a keystroke. You can exit the program and get into the monitor with Control-Q, then return to the program with Control-Y. The program also contains a line editor which is handy for entering ASCII data. For example, it allows you to put control characters in file names.

To put any data back to the disk, you have to move the edit buffer back to the working buffer and issue a write command. These steps help protect against unwanted writes. There is little chance of destroying a sector by sending bad or incorrect data to it.

The manual is clear, and contains some applications notes showing how to use the program to resurrect a dead file, change a binary file to a text file, and other tricks. Disk Fixer is a superb program.

Choices

The Dakin5 program works only with DOS 3.3, thus those with older versions of DOS will be unable to use it. The Image program works with either DOS, but contains fewer utilities. The programmer who needs to do a large amount of specialized work on sectors, or who doesn't require the other utilities, would probably do best buying Disk Fixer. If you need a wide range of utilities, and you don't plan to do extensive work on disk sectors, the Dakin5 package would be the best purchase. Those who need all the utilities and who also want to do a lot of sector work might consider investing in both packages.

Disk Fixer and Dakin5 Programming Aids are quality pieces of software which perform as promised. They are two utilities that can make life easier for the Apple owner. ☐

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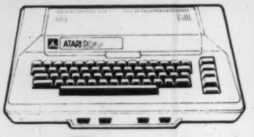

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MDS-DRV-D	495.00
MDS-DRV-Q	665.00
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ADC-1-Q	795.00
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EPSON MX-80	499.00
EPSON MX-80 FT	599.00
GRAFTRAX	90.00
INTERFACE (APPLE)	75.00
CABLE	22.50
CENTRONICS 737-1	795.00
CENTRONICS 737-3	855.00
IDS 445G	815.00
IDS 460G	1195.00
IDS 560G	1450.00
NEC 5510 W/TRACTORS	2650.00
NEC 5520 KSR W/TRAC.	2995.00
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FORMS TRACTOR	195.00
STARWRITER W/TRAC.	1695.00
STARWRITER W/O TRACTOR	1500.00

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CIRCLE 178 ON READER SERVICE CARD

The business information you need at the turn of a key.

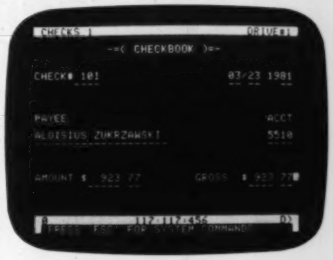
Datadex is a new interactive business management system designed for the Apple personal computer. It's from IUS, the people who brought you EasyWriter™ and who are bringing you new products for office automation, education, and development systems.

Datadex is short for **data index.** It lets you put all your business data into your Apple the way you like to see it and manipulate it any way you want. **It adapts to your way of doing business.**

Want to generate a sales report? Just press four keys and fill in the blanks. That puts your sales data into the computer. Now, your report: Datadex **designs it for you,** based on what you've entered. Nothing to it. That's **power!**

You can do the same with phone lists, mailing lists, dealer names or inventories. They all enter Datadex and form your own personal **data base.**

Want to find a company but don't know how to spell its name? Try something that sounds close, and our **Soundex** routine will find it. It is very forgiving on typos and extra spaces.



```
CHECKS 1                                DRIVE#1
              -=( CHECKBOOK )=-

CHECK# 101                         03/23 1981


PAYEE                                    ACCT
ALOISIUS ZUKRZAWSKI                      5510


AMOUNT $  923 77         GROSS   $ 923 77

B              112:112:456                  D>
 PRESS 'ESC' FOR SYSTEM COMMAND"
```

Soundex helped us find Mr. Zukrzawski when we were balancing our checkbook. We weren't sure how to spell Al's name, so searched for Al Z and found him. Instantly. The check register and several other applications are free with Datadex.

Want a specific piece of information, like sales for January 14–21? Inquire Datadex and the answer comes up on the screen right now. And right.

Want a report of all sales in ZIP code areas starting with 9? Sure. Just ask it to print a report.

But seeing is the only way to believe. Get a demonstration of Datadex at your local Apple dealer. See the personal computing power it can bring to your office and home. If you've looked at a VisiCalc-type program, see Datadex before you buy.

By the way, about IUS. We're the Apple of software. We got there by giving you great products and super support. We provide customer service over the phone. Professionally written documentation. And products that are never outdated, only updated. Information Unlimited Software, Incorporated,
281 Arlington Ave., Berkeley,
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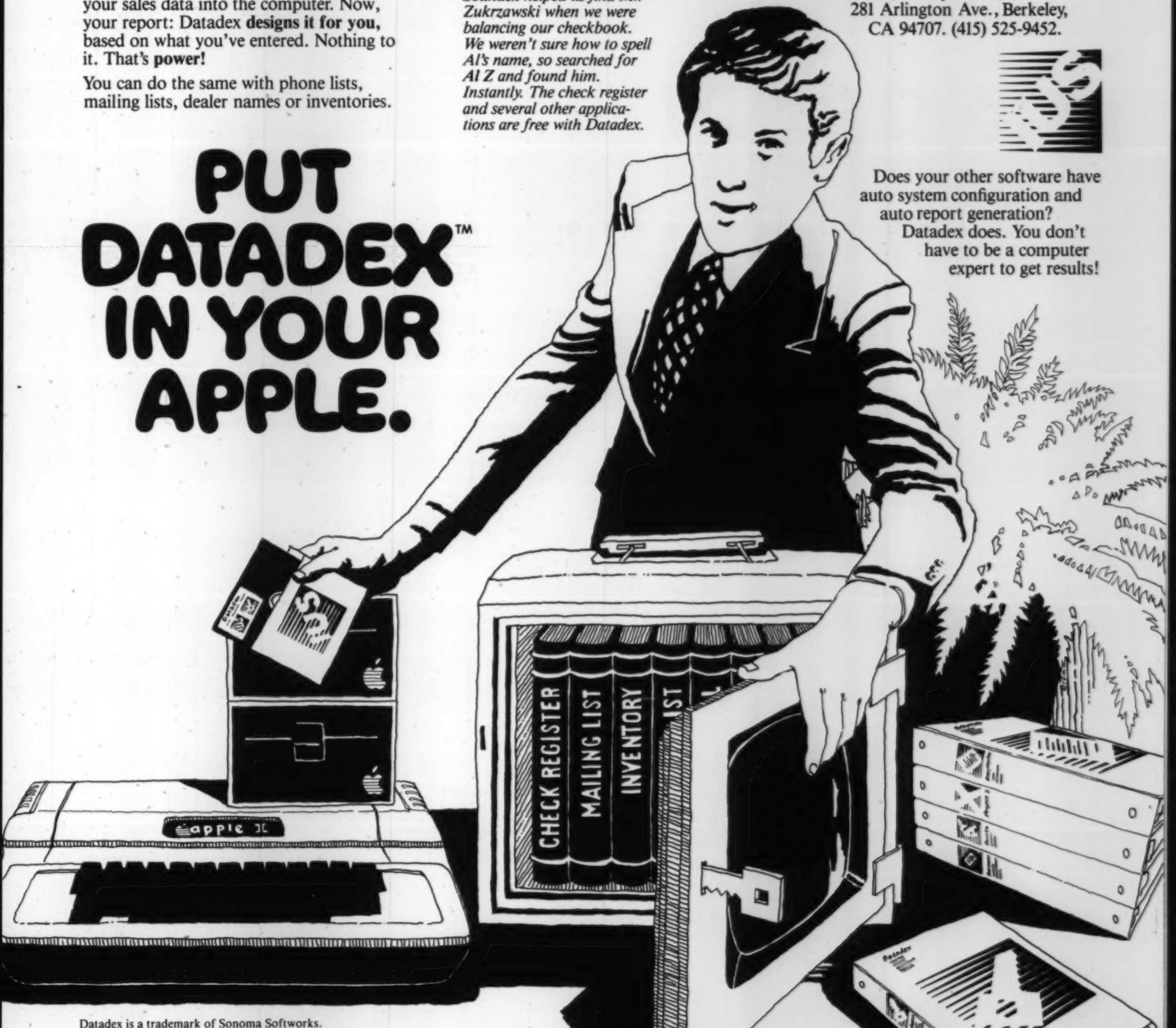

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CIRCLE 151 ON READER SERVICE CARD

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Comparison of Basics

● means the feature is in this BASIC.

	ATARI	APPLE INTEGER	APPLESOFT	EXIDY	TRS 80 LEVEL I	TRS 80 LEVEL II	TRS 80 DOS	PET
BASICALLY BASIC								
VARIABLES								
NAMES								
Long Names	●	●						
Short Names			●	●	●	●	●	●
TYPES-NUMERIC								
Integer		●	●	●		●	●	●
Floating Point	●		●	●	●	●	●	●
Double precision						●	●	
TYPES-STRING								
DEC Style			●	●		●	●	●
HP Style	●	●						
TYPE DECLARATIONS								
DEFINT						●	●	
DEFSNG						●	●	
DEFDBL						●	●	
DEFSTR						●	●	
ARRAYS								
DIM	●	●	●	●		●	●	●
Numeric	●	●	●	●		●	●	●
String			●	●		●	●	●
INITIALIZATION								
Set to 0 or null			●	●		●	●	●
Memory trash					●			
Unknown	●	●						
ARITHMETIC								
COMPUTATION								
Binary Float point			●	●	●	●	●	●
16 bit integer		●	●	●		●	●	●
BCD Float point	●							
ASSIGNMENT								
LET	●	●	●	●	●	●	●	●
MID$ on left							●	
OPERATORS								
Arithmetic (*/+-etc)	●	●	●	●	●	●	●	●
Relational (gt, lt, etc)	●	●	●	●	●	●	●	●
Logical (AND,OR, NOT)	●	●	●	●	●	●	●	●
Boolean	●	●			●			
16 bits			●	●		●	●	●
String relational	●	●	●	●		●	●	●
Concatenation	●	●	●	●		●	●	●
FUNCTIONS								
ARITHMETIC								
ABS	●	●	●	●	●	●	●	●
EXP	●		●	●		●	●	●
FIX						●	●	
INT	●		●	●	●	●	●	●
LOG	●		●	●		●	●	●
LN	●							
MOD		●						
RND	●	●	●	●	●	●	●	●
RANDOM						●	●	
SGN	●	●	●	●		●	●	●
SQR	●		●	●		●	●	●
TRIGNOMETRIC								
DEG	●							
RAD	●							
ATN	●		●	●		●	●	●
COS	●		●	●		●	●	●
SIN	●		●	●		●	●	●
TAN			●	●		●	●	●

	ATARI	APPLE INTEGER	APPLESOFT	EXIDY	TRS 80 LEVEL I	TRS 80 LEVEL II	TRS 80 DOS	PET
STRING								
ASC	●	●	●	●		●	●	●
CHR$	●		●	●		●	●	●
INSTP.							●	
LEFT$			●	●		●	●	●
LEN	●	●	●	●		●	●	●
MID$			●	●		●	●	●
RIGHT$			●	●		●	●	●
STRING$						●	●	
STR$	●		●	●		●	●	●
VAL	●		●	●		●	●	●
OTHERS								
DEF_FN			●	●			●	●
FRE	●		●	●		●	●	●
MEM					●	●	●	
TI								●
TI$								●
TIME$							●	
CONTROL OF PGM FLOW								
BRANCHES								
GOTO	●	●	●	●	●	●	●	●
IF-THEN	●	●	●	●	●	●	●	●
ELSE						●	●	
ON-GOTO	●		●	●		●	●	●
SUBROUTINES								
GOSUB	●	●	●	●	●	●	●	●
RETURN	●	●	●	●	●	●	●	●
POP	●	●	●					
ON-GOSUB	●		●	●		●	●	●
LOOPS								
FOR	●	●	●	●	●	●	●	●
NEXT	●	●	●	●	●	●	●	●
STEP	●	●	●	●	●	●	●	●
OTHER								
END	●	●	●	●	●	●	●	●
STOP	●		●	●	●	●	●	●
REM	●	●	●	●	●	●	●	●
INPUT / OUTPUT								
INTERNAL								
DATA	●		●	●	●	●	●	●
READ	●		●	●	●	●	●	●
RESTORE	●		●	●	●	●	●	●
KEYBOARD								
GET			●					●
INKEY$						●	●	
INPUT	●	●	●	●	●	●	●	●
LINE INPUT							●	
TO SCREEN								
PRINTING								
PRINT	●	●	●	●	●	●	●	●
PRINT AT,@					●	●	●	
PRINT USING						●	●	
SPEED			●					
NULL				●				
TABULATION								
HTAB			●					
VTAB		●	●					
POS			●	●		●	●	●
SPC			●	●				●
TAB			●	●	●	●	●	●
MODES, MOTION								
Cursor Movements	●	●	●	●		●	●	●
CLS					●	●	●	
HOME			●					
FLASH			●					
INVERSE			●					
NORMAL			●					
TEXT		●	●					

	ATARI	APPLE INTEGER	APPLESOFT	EXIDY	TRS 80 LEVEL I	TRS 80 LEVEL II	TRS 80 DOS	PET
FILES								
GENERAL								
CLOSE	●						●	●
CMD								●
GET#								●
INPUT#	●				●	●	●	●
OPEN	●						●	●
PRINT#	●				●	●	●	●
STATUS	●							
STORE			●					
RECALL			●					
DISC								
Type Conversions								
CVD							●	
CVI							●	
CVS							●	
CDBL						●	●	
CINT						●	●	
CSNG						●	●	
MKD$							●	
MKI$							●	
MKS$							●	
Pointers								
EOF							●	
KILL							●	
LOC							●	
LOF							●	
NOTE	●							
POINT	●							
XIO	●							
Data Xfers								
FIELD							●	
GET	●						●	
PUT	●							
LSET							●	
RSET							●	
COMMANDS								
PROGRAM CONTROL								
CLEAR			●	●		●	●	
CLEAR n				●		●	●	
CLR	●	●						●
CON		●						
CONT	●		●	●	●	●	●	●
NEW	●	●	●	●	●	●	●	●
RUN	●	●	●	●	●	●	●	●
DISPLAY								
LIST	●	●	●	●	●	●	●	●
LLIST						●	●	
LPRINT	●					●	●	
OFF-LINE STORE								
CLOAD	●			●	●	●	●	
CLOAD?						●	●	
CSAVE	●			●	●	●	●	
ENTER	●							
LOAD	●	●	●					●
MERGE							●	
SAVE	●	●	●					●
VERIFY								●
EXITING								
BYE	●			●				
DOS	●							
EDITING								
Abbreviations	●				●			●
AUTO		●				●	●	
DEL		●	●					
DELETE						●	●	
EDIT						●	●	
MAN		●						
Multistatement Lines		●	●	●	●	●	●	●
Screen Editor	●							●
Line Editor		●	●			●	●	
DEBUGGING AIDS								
Direct Mode	●	●	●	●	●	●	●	●
DSP		●						
NO DSP		●						
TRACE		●	●					
NO TRACE		●	●					
TRON						●	●	
TROFF						●	●	

	ATARI	APPLE INTEGER	APPLESOFT	EXIDY	TRS 80 LEVEL I	TRS 80 LEVEL II	TRS 80 DOS	PET
ERRORS								
MESSAGES								
English		●	●					●
Cryptic	●●			●	●	●	●	
TRAPS								
ON ERR GOTO			●			●	●	
RESUME			●			●	●	
TRAP	●							
ERR						●	●	
ERROR #						●	●	
ERL						●	●	
NOT SO BASIC								
MACHINE LANGUAGE HOOKS								
CALL		●	●					
SYS								
SYSTEM								●
USR	●		●	●		●	●	●
ADR	●							
VARPTR						●	●	
WAIT			●	●				●
DEFUSR							●	
HIMEM		●	●					
LOMEM		●	●					
INP				●		●	●	
OUT				●		●	●	
IN#		●	●					
PR#		●	●					
PEEK	●	●	●	●		●	●	●
POKE	●	●	●	●		●	●	●
GRAPHICS								
DIRECT CONTROL								
PEEK/POKE		●		●		●	●	●
ROM ROUTINES		●						
DISPLAY MODES								
GR		●	●					
GRAPHICS	●							
HGR			●					
HGR 2			●					
COLORS								
COLOR	●	●	●					
SETCOLOR	●							
HCOLOR								
DRAWING								
HLIN		●	●					
VLIN		●	●					
PLOT	●	●	●					
HPLOT			●					
HPLOT TO			●					
DRAW TO	●							
DRAW AT			●					
XDRAW			●					
ROT			●					
SCALE			●					
SHLOAD			●					
SET					●	●	●	
RESET					●	●	●	
SCREEN SENSES								
LOCATE	●							
POSITION	●							
POINT					●	●	●	
SOUND								
PEEK/POKE		●	●					●
Additional hardware								●
SOUND	●							
SENSING THE WORLD								
PEEK/POKE + hardware								●
PADDLE	●							
PTRIG	●							
PDL		●	●					
STICK	●							
STRIG	●							

Spending Bucks for Bits

Guidelines for Buying Game Software

David Lubar

A trip to any computer store, or a browse through this magazine, will produce the rather shocking insight that software is not cheap. Some programs can set you back more than a week's groceries. But the situation is not all bad. With a bit of thought, and some careful buying, it's possible to develop a good software library for your computer. The key here, as in most consumer areas, is getting the most for your money.

In the case of software, the "most" means several things. First, it refers to a concept that could be described as play value. A game that you will play for extended periods of time, or that you will play often, has more play value than a game of the same price which you play only a few times. For instance, if you enjoy a game in an arcade, you'll probably enjoy the computer version, assuming the computer version is similar to the arcade one. *Super Invasion*, *Asteroids in Space*, and *Galaxian* would be examples of this. Most people who buy these games have already played them and know what they are getting. And there is the comfort of knowing that each time you play the game, you're saving a quarter.

Unfortunately, some games are unknown quantities. All you have to go by is an advertisement. That's where your local computer store can come in handy. Most stores have computers available for customers who want to try a program before buying it. The trick here is looking beyond the first impression. Most games, through novelty alone, will be fun at first. But the game that was thrilling in the store might become boring after a few hours of play. You can avoid this problem by looking for certain qualities that most good games contain.

A good game isn't easily mastered. If you can win every time, there is no challenge. In many arcade games, you never win, you just survive, trying to get as high a score as possible. Theoretically, there is no limit to the score you can reach. Some of these games offer bonuses at certain scores, giving you an extra ship every 10,000 points, for instance. This gives you something to shoot for, and increases the play value of the game.

Another important factor is variety. Doing the same thing over and over is fine if you work on an assembly line, but I wouldn't want to pay cash for the opportunity. Variety comes in two forms. Some games become more difficult as you progress, some throw in certain extra features at random or at predetermined times, some do both. In *Asteroids* and *Super Invader*, you have an occasional enemy ship floating by for variety, in *ABM* some of the warheads split into multiple missiles, in *Star Raiders* there are two types of enemy ships. Imagine these games without this variety and you'll have an idea of programs that don't offer enough play value. Imagine playing a version of *Pacman* where the ghosts didn't get tougher at higher levels. That could be as exciting as practicing touch typing.

If you can't get to a computer store, you have to rely on advertisements, but you can still look for such factors as multiple skill levels, variety, and bonuses. Another guideline is to deal with known factors. Some companies can do no wrong while others can't seem to do anything right. If one product from a company is good, the odds are in your favor when you make another purchase from them. If a company with which you aren't familiar has several games that interest you, it might be a good idea to buy the least expensive game first. This will give you a feel for the general product line, as well as insight into how well they fill orders, how well they package progams, and how good their documentation is.

Of course, not all games are of the arcade type. It isn't easy to tell a good chess program from a great one without extensive play. Luckily, programs of this sort receive a great deal of attention in magazines. If all reviews are favorable, you're dealing with a known quantity. The only question remaining is whether the game gives you what you want. A program for practicing bridge bidding won't satisfy you if you want to play the actual game against the computer. On the other hand, you can also save money by making sure you don't pay for more than you need. A casual chess player who just wants a game now and then doesn't need the top program on the market. He'll be just as happy with a less expensive program that doesn't play at the Master level.

Adventures are the sort of games that can quickly empty your bank account. Most can be compared to crossword puzzles in that once solved, there is nothing to do but move on to the next one. Still, many people are addicted to the challenge and, for them, the programs are worth the price. There are many companies offering such games and the quality varies. Again, reading the reviews is a good way to start. Some Adventures offer random factors or changes, providing for more play value. Since this is a strong selling point, the ads usually specify such features when they exist. Even here, you have to be careful. If a game just changes the names of the rooms, you aren't getting as much variety as you would if it changed the locations of the treasures, or adjusted the strength of the monsters as you progressed.

There are many games designed for two players. In some, the computer just acts as a referee. This can be either an advantage or a waste of money, depending on the game. A program that flips Othello pieces for two players is a handy thing to have (though it should cost considerably less than a program that actually plays the game); a program that moves checkers for two players would be a total waste of money. You have to decide whether the function provided is worth the cost.

It may seem that obtaining a decent software library is a costly task, but there are ways to get a good selection of games without going broke and without violating copyright laws. While the really spectacular games are usually only offered as software, many good games appear in magazines and books. A few hours of typing can help fill out your library. Some companies offer game packs containing four or five programs on a single disk or tape. Again, these are good library builders, giving you some choice and variety in your collection. Finally, if you don't like the games that are available, you can always try writing one. Give it variety, challenge, and a lot of play value, and it might end up as a part of many other people's libraries.

Listed below are representative games that have received one or more favorable

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CIRCLE 107 ON READER SERVICE CARD

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CIRCLE 117 ON READER SERVICE CARD

Game Software, continued...

reviews in *Creative Computing* and/or other magazines. We've also included some new ones judged to have good playing qualities by our staff. We must emphasize that this is by no means a list of every good game package; there are manufacturers not represented that have excellent wares.

The rating also, is necessarily subjective. For example, one game that person G found held his interest for days and weeks as he strived for greater mastery, Person D, a less patient sort, found quite frustrating. So our rating must be taken with a grain of salt.

Arcade Games

Olympic Decathlon is the best sports game available for Apple and TRS-80. Up to six players compete in ten events. Outstanding graphics. From Microsoft ($24.95).

Raster Blaster, the first offering from BudgeCo., is the best pinball game for the Apple. The author, Bill Budge, is noted for his graphics work ($29.95). *Pinball* for the TRS-80, from Acorn Software, will satisfy the flipper frenzy of even the most ardent arcade addict ($14.95 on tape, $20.95 on disk).

Space Invaders, an arcade classic, is probably the best selling game of all time. The Apple and Sorcerer versions, *Super Invasion*, are from Creative Computing ($19.95 on tape for Apple or Sorcerer, $29.95 on disk for Apple). The Atari version comes from Atari ($19.95). Commodore produces *Space Intruders* for the PET ($19.95). TRS-80 owners can enjoy *Invaders from Space* by way of Acorn Software ($14.95 for tape, $20.95 for disk).

Galaxian, an offspring of *Space Invaders* with a cult of its own, comes in an Apple version called *Alien Rain* from Broderbund Software ($24.95). An advanced version, *Alien Typhoon* should be on the market by the time this reaches print. An excellent TRS-80 version, *Galaxy Invasion*, is distributed by Big Five Software ($15.95 for tape, $17.95 for disk). For OSI systems, try *Galaxia* from Aardvark Technical Services ($9.95 on tape, $12.95 on disk).

Asteroids in Space is another game that people line up to play. Quality Software has *Meteoroids in Space* for the Apple ($19.95). An extended version should be out soon. California Pacific gives us *Apple-oids* ($29.95). Big Five Software come through again with Super Nova for the TRS-80 ($15.95 on tape, $17.95 on disk).

Missile Command lets the player attempt to stave off nuclear destruction of major cities. There are several versions out, but the best for the Apple is *ABM* from Muse ($24.95).

Basketball is the staff's favorite Atari game. The $39.95 cartridge is worth every penny. Great graphics and a lot of fun. *Star Raiders* pulls a close second, offering the best fly-and-shoot graphics on the market ($39.95).

Flight Simulators let a player control an airplane. SubLOGIC has cornered the market with the *A2 FS1 Flight Simulator* for the Apple ($25 on tape, $33.50 on disk), and the *TS-80 Flight Simulator* for the TRS-80 ($25).

Lunar Landers let people land, or crash, on the moon. *Tranquility Base*, another Bill Budge classic, is from Stoneware ($24.95). Adventure International has *Lunar Lander* for TRS-80 ($14.95 on tape, $20.95 on disk) and Atari ($14.95). *Graphics Games-II* for the PET and *Graphics Games* for the Sorcerer, from Creative Computing, contain *LEM* and five other games ($11.95 on tape).

Star Trek fans can get real-time action from *Time Trek* for the TRS-80 and PET ($19.95) from Personal Software. Rumor has it that Rainbow is working on an updated version of *A Stellar Trek* for the Apple. The existing version is quite good ($24.95). Continental Software has Trek for the Apple in *Hyperspace Wars* ($29.95, including *3-D space battle*). Aardvark offers *Time Trek* for the OSI ($9.95). Color Software has *3-D Startrek* for Apple, Atari, and TI 99/4 ($15.00).

Sabotage from On-Line Systems lets the Apple owner defend against helicopters dropping paratroopers. If too many land safely, they blow up the player's gun ($24.95).

Breakout, one of the earliest arcade games, comes courtesy of Tandy Corporation as *Bustout* for the TRS-80 Color Computer ($39.95). *Super Breakout* from and for Atari includes variations such as Double Cavity and Progressive ($39.95). Computer Information Exchange has *Demolish* and five other games on one tape for the TRS-80 Color Computer ($19.95). They also offer several very low priced library packs for the TRS-80 and a lot of good system software.

Duelin' Droids for the TRS-80 displays TRS-80 graphics at its best, letting the player engage in swordplay or sit back and watch his champion fight in the arena. From Acorn ($14.95 on tape, $20.95 on disk).

Dogfight, from Micro Lab for the Apple, lets one or two air aces shoot it out with other planes and helicopters ($29.95). A fun and challenging game. Also for the Apple is *Red Baron*, pitting one player against a computer-controlled enemy. From Spectrum Software ($14.95).

The Maze Game from Muse has the best lo-res Apple graphics yet produced ($12.95). Beagle Brothers lets players chase through a maze in *Wowzo*, one of three games on *Game Pack 2* ($24). For the TRS-80, Tunnel Vision from Creative Computing gives a 3-D view of the maze ($11.95 on tape with four other programs).

Dinowars, from Tandy, is an outrageous battle of behemoths for the TRS-80 Color Computer ($39.95).

Super Starbase Gunner, from Computer Packages Unlimited, is a 3-D space game with ten skill levels. The disk also contains *The Designer*, a very sophisticated graphics utility ($29.95).

Soccer, a cartridge from Texas Instruments, is absolutely the best game available for the TI 99/4. It has cost this company more man (and woman) hours than any other program ($29.95). On-Line Systems has *Hi-Res Soccer* for the Apple ($29.95). Their *Hi-Res Football* ($39.95) is also quite good.

Pacman is a game of nerve and coordination. You move through a maze eating small dots and avoiding hungry ghosts. Broderbund's *Snoggle* for the Apple will delight *Pacman* fans ($24.95).

Fantasy Games

Adventures allow the player to explore unknown worlds, giving commands to the computer in English. The series by Scott Adams, *Adventures* number 1 through 9, are the earliest popular versions. Some or all are available for TRS-80, Apple, PET, and Sorcerer. The lower numbers represent easier games, though all are challenging. Creative Computing offers them in convenient three-packs on disk and individually on tape. Prices start at $14.95.

Original Adventure, the game that started on large computers, is available for TRS-80 and Apple from Microsoft ($29.95). Creative Computing has it for Atari ($19.95 on tape, $24.95 on disk) and a bilingual version that displays either French or English for CP/M systems ($24.95). *Hi-Res Adventures* were the first of many excellent products from On-Line Systems. They have three for the Apple, and a fourth in the chute. *The Wizard and the Princess* is the most challenging ($39.95).

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Oldorf's Revenge offers more than 100 rooms displayed in hi-res on the Apple. That's enough to keep any adventurer busy for a while ($19.95).

Mad Venture from Micro Lab tests the ingenuity of Apple owners, adding riddles and puzzles to the Adventure format. A series is projected ($24.95).

Odyssey, The Compleat Adventure, from Synergistic Software allows Apple owners to explore an island, gather men and supplies, then (if still alive) sail in search of treasure. Unlike many Adventures, the game can be played and enjoyed repeatedly ($30).

Hellfire Warrior is the highlight of a series of graphic dungeon romps from Automated Simulations (the series is produced under the EPYX label). The program employs good graphics and a vast selection of rooms to explore. PET, Apple, and TRS-80 versions are available ($39.95). Automated Simulations has also just introduced *Star Warrior*, with two scenarios and five skill levels. It is available for Apple, TRS-80, and Atari.

Zork expands on earlier Adventures by allowing the input of full sentences instead of just two-word commands. For Apple and TRS-80 from Personal Software ($39.95).

Wizardry from Sir-Tech allows the Apple to act as a dungeon master, taking the players characters to a multi-level 3-D dungeon. (Boot disk and initial scenario are $40, future scenarios will be priced in the $20-$30 range.)

Time Traveler from Krell lets Apple, PET, and TRS-80 owners journey through the ages recovering lost time rings. The game can be replayed at different skill levels ($24.95).

The Quest is the first in a series that will constitute one large Adventure for the Atari. The program features over 60 locations. From Survival Software ($14.95 on tape, $19.95 on disk.)

Asylum is the latest of a series of 3-D Adventures from Med Systems Software. For Apple and TRS-80 ($14.95), the games are tricky and fun.

Beneath Apple Manor, an early entry in the field, is still good fun. The game, from Quality Software, falls more into the search-and-fight category, using single-letter commands rather than English phrases.

Death Dreadnaught, from The Programmer's Guild, is a gruesome program for none but the brave. This TRS-80 game ($14.95 on tape, $19.95 on disk) puts you in a wrecked spaceship filled with deadly distractions.

The Prisoner from Edu-Ware puts the Apple owner on an island filled with physical and psychological dangers. Twenty separate locations each contain a mini-Adventure. Solve them and you might escape.

Interactive Fiction is the generic name Robert Lafore has given to a series of programs that allow players to become a character in a story. TRS-80 versions are available and Apple versions should be on the market any day now. The favorites here are *Six Micro Stories* ($14.95) and *HMS Impetuous* ($19.95). From Interactive Fiction.

Sword Thrust from CE Software is a series starting with *The King's Testing Grounds*. Characters in this Apple Adventure can gain attributes as they move from game to game. ($29.95 for the first disk, $24.95 for all others.

Simulations and Strategy Games

Top honors in this field go to *Strategic Simulations* for their excellent line of Apple wargames. The favorite around here is *The Warp Factor*, a space battle requiring skill and strategy. ($39.95) Some of their line is also available for the TRS-80. Another space-fight simulation for the Apple is *Galaxy Space War I* from Galaxy. Automated Simulations has *Starfleet Orion* and *Invasion Fleet Orion* for the Apple, PET, and TRS-80 ($24.95).

Sargon is the top chess program. Hayden has it on tape ($29.95) and disk ($34.95) for TRS-80, Apple, and the Ohio Scientific Challenger Series.

Milestones, based on a French card game, employs good use of Apple hi-res graphics and plays a mean hand. Available from Creative Computing ($11.95 on tape, $19.95 on disk).

Bridge 2.0 from Dynacomp, is the best program of this sort. Available for Apple, TRS-80, PET, Atari, North Star, and CP/M systems, it allows the player without partners to bid and play against a tough opponent ($17.95 on tape, $21.95 on disk).

Cribbage can be played on the Apple with On-Line System's *Hi-Res Cribbage* ($24.95). Dynacomp has *Cribbage 2.0* for the TRS-80 ($14.95 on cassette, $18.95 on disk). Creative Computing brings us *Cribbage* for the Atari ($11.95 on tape, $24.95 on disk with *Tilt* and *Dominos*).

Fastgammon is the long-time favorite backgammon game for Apple owners. From Quality Software ($19.95 on disk, $24.95 on tape).

The Galactic Saga is a series from Broderbund that now includes four games. The latest is *Tawala's Last Redoubt* for TRS-80 ($19.95 for tape, $24.95 for disk) and Apple ($29.95). These are thinking games requiring the skill and calculation of a career diplomat.

Titanic Quest for the OSI lets the player search in real time for a sunken ship. From Aurora Software Associates ($6.95).

The Creativity Package, though not a simulation, is hard to classify. From Avant-Garde Creations, it allows the user to create prose, poetry, graphic art and music on the Apple ($19.95).

Three Mile Island from Muse lets the player try his luck at avoiding the big meltdown without risking hair loss or premature glowing ($39.95).

Hammurabi is a classic simulation where the player tries to manage an agrarian culture without starving the populace. Atari calls it *Kingdom*. Creative Computing has it, along with 49 other games, on the CP/M disk *Basic Games-1* ($24.95). Instant Software offers an expanded version called *Santa Paravia and Fiumaccio* for the Apple ($9.95 on tape, $19.95 on disk).

On The Horizon

The following games have either just been released or are waiting release. Apple owners should keep an eye out for *Wolfenstein Castle* from Muse. It combines arcade and adventure aspects. Also from Muse is *Robot Wars*, which puts player-programmed robots into an arena. *Blisterball* from Creative Computing is an original arcade game that should be one of the best releases of 1981. *Dragon Fire*, a dungeon Adventure from Level-10 (a subsidiary of Dakin5) features ten levels with over 150 treasures. It should be quite good. A Sorcerer version of *Pacman* will be on the market in a few months. Leo Christopherson is rumored to be working on a new TRS-80 game, a prospect that should delight fans of *Duelin' Droids* and *Android Nim*. These programs and many others will be reviewed as soon as they are available.

SORCERER™ SOFTWARE

We are a small Western Australian business who's aim is to bring you the highest quality software for your SORCERER computer at the lowest price. A catalog such as this is produced regularly and sent to all parts of the world, free of charge, to interested Sorcerer Owners. If your name is not on our list, let us know.

UTILITY PACKAGES:

SCOPE by Ross Williams

This very handy utility makes searching, viewing and editing memory a breeze. A specified memory block may be looked at in ASCII format and changed with the use of uniquely fascinating 'window' display. If you fiddle with the monitor at all, if you explore machine code programs and wish to cheat in ADVENTURE games, this program is for you! Customise commercial programs to suit yourself, change messages in games such as GALAXIANS and GROTNIK WARS and re-write the Machine Code Tutorial Package! SCOPE comes with detailed documentation which is available free upon request.

Cassette $17.50

SCOTE by Ross Williams

Screen Orientated Text Editor for the Development PAC. How many times have you been frustrated with the editor in the Development PAC. Now you can create your assembly language programs with the aid of a Wordprocessor type editor. Comes with detailed documentation which is available free upon request.

Cassette $23.50

SYSTEM 3 by Richard Swannell

System 3 is the ultimate program development toolkit and is guaranteed to cut your programming and debugging time by half! Once loaded, this program gives your Sorcerer Standard Basic ROM PAC an extra 15 commands, not mentioning a host of other features. The editor itself is simply out of this world!

The following commands are just a sample:

```
EDIT x,y               AUTO x,y        RENUMBER a,b,c,d
TRACE xx, 'string'     HELP xx         FIND 'string'
DEFINE x               VARIABLES       LIST xx-yy
DELETE xx-yy           CLOSE           OLD
MERGE                  CLOAD?          Control P
```

System 3 loads with a simple LOG command and relocates itself to the top 3K of available RAM. Printer Drivers are included and many of the bugs in the ROM PAC have been healed. Over 500 users have this amazing utility already and wouldn't be without it. System 3 is the most powerful utility for Sorcerer Basic in existence, as well as the least costly. You will find System 3 easy to use, fast, efficient and reliable.

Cassette $29.95

SCREEN GENIE by Don Ursem

Screen Genie is a compact machine language program which can be loaded along with BASIC or Z-80 application programs. By adding only a few POKE statements to your program, GENIE gives you the following: PRINT AT feature, erase of any rows of the display, scrolling of any portion of the screen, inverted and indented printing. SCREEN GENIE comes with a demo program which shows all the features in BASIC language routines.

Cassette $15.95
Micropolis II diskette $18.95

HARDWARE

SOUNDPLUG

Many programs written for the SORCERER produce audio output by using the parallel output port. Unfortunately this port is designed to drive logic circuits and connecting a loudspeaker directly to the port can damage the computer. Feeding the speaker via a resistor will protect the computer, but this results in a woefully inadequate sound level if a safe value of resistance is used. The SOUNDPLUG has been designed to solve this problem. It consists of a two stage power amplifier with volume control all fitted inside a standard "D" connector housing. Connect an eight ohm speaker to the RCA audio connector on the SOUNDPLUG and run your GALAXIANS, GROTNIK WARS, SCOPE, EDOS and TOUCH-TYPE TUTOR with sound effects! SOUNDPLUG is a direct coupled amplifier and can be used to drive speakers, 5 volt relays and motors, etc. SOUNDPLUG is a must for all Sorcerer owners.

Only $19.50

DISK OPERATING SYSTEMS:

EDOS by Gerrard Neil

For those users having Micropolis 5 1/4 inch Disk Drives, this is what you have been praying for! EDOS is a complete Disk Operating System, fully compatible with the Micropolis model I and II disk drives, and is an affordable link between Exidy Standard Basic and Disks. Now there is no need to re-write all your cassette based BASIC programs in disk BASIC. EDOS allows you to CLOAD them into memory, SAVE them on disk and still run them with ROM PAC BASIC!!

The EDOS software package enhances the STANDARD BASIC ROM PAC with:

Disk Commands

```
SAVE      filename <drive> <filetype>
LOAD <G>  filename < drive> <address>
FILES     <drive>
TYPE      filename < drive>
SCRATCH   filename <drive>
RENAME    filename <drive> filename2
HRG       Enable high resolution graphics
HSET x y  Turn on single point
HRST x y  Turn off single point
```

Printer Functions

```
PRINTON
PRINTOFF
```

Graphics Functions

```
GR        Enable low resolution graphics
SET x y   Turn on a quarter character block
RST x y   Turn off the above block
```

Miscellaneous Functions

```
OLD       Recover BASIC program
CALL      address <param1> <param2> <param3>
          Call machine code routine
BEEP      length frequency - Output sound
```

All of the above commands may be used in command code mode and within your BASIC program! EDOS allows you to place your Standard Basic cassette based programs on disk. And as if that isn't enough, gives you the above functions as well as full SCREEN BASED EDITOR!!

Introductory price $45.90

EDUCATIONAL PACKAGES:

TOUCH-TYPE TUTOR by Roy Mercer

Think of the time you could save if you could Touch Type efficiently and accurately. TOUCH-TYPE-TUTOR will have you typing with speed and skill and with as much fun as playing Space Invaders. Your SORCERER has an excellent standard shifted full keyboard virtually identical with any high quality electric typewriter and has a memory mapped video display with superb graphics that allows fast screen animation. AND NOW SORCERER has TOUCH-TYPE-TUTOR, an interactive animated audio-visual teaching programme/game.

How does it work? They say "Watched pot never boils" and watched fingers will never type properly. It is essential to keep your eyes off the keyboard – an impossibility for the beginner or for the self-taught two finger typist. TOUCH-TYPE-TUTOR overcomes the problem by putting the keyboard on your monitor screen. A split screen display shows your typing Exercise on the lower half, while the upper screen displays an image of the Standard Keyboard. As you progress through the Exercise, the appropriate keys are lit up on the screen image, instantaneously prompting the next correct finger movement. Hit the wrong key and it flashes on the screen. A speaker connected to the parallel output port will beep on errors to further reinforce the negative feedback.

TOUCH-TYPE-TUTOR teaches step by step, introducing the keys in a logical manner and indicating the correct fingering – even which shift key to use for the upper case characters. Extra features include a facility to set up your own Exercises for problem keys and the ability to turn off the screen prompt for advanced practice. You will find yourself rapidly improving your speeds as your accuracy increases.

Cassette $18.50
Micropolis II diskette $21.50

MACHINE CODE TUTORIAL PACKAGE by Richard Swannell

Can you really operate your Sorcerer after typing BYE? Where do you look for information on Z-80 machine code programming? If you can programme in BASIC this package will give you everything you want to know about your Sorcerer, with easy-to-understand, lightly written tutorials. Covers such topics as: Monitor Commands, most Z-80 instructions, Hex-Binary-Decimal conversions, RAM and ROM, Source and Object Codes, Assembly Language, Hand Coding, Video and Keyboard Routines, Input and Output Vector Manipulation, Memory Maps, Video and Screen RAM, Graphics and DMA, Cursor Control, Monitor and BASIC work areas, Special purpose 'GO' addresses of the monitor and BASIC ROM PAC, Storage and Linking of BASIC programmes, parallel and Serial Interfacing, Cassette Routines, Sound Generation, No-Stop Keyboard Input, disenabling CTRL C and ESC...which is so much more than you will be able to find in any manual. A set of 8 tutorial programmes designed to show the BASIC programmer what to do with his Sorcerer. This Tutorial Package is more than a purchase, it is an investment.

Cassette $24.95
Micropolis II diskette $27.95

BASIC TUTORIAL PACKAGE
by Richard Swannell

This set of 9 tutorials teach Sorcerer Basic to the NOVICE. It is already in several schools where we are receiving extremely favourable comments. Lightly written, entertaining and humorous, this Basic Tutorial Package is ideal for anyone, regardless of age or prior computer knowledge. Let your Sorcerer teach you!

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GAMES:

GROTNIK WARS by Ross Williams

This is it! A breathtaking 3 dimensional simulation arcade game. We wanted to call it Dynasty, but Ross is determined that a game with a difference should have a name with a difference!

It's a video arcade game that isn't coin hungry. You, as commander of a star ship, must search out and destroy enemy spaceships in 8 galaxies. Of course, you have only a certain amount of energy, and when you fight an enemy ship that is in your galaxy, it may fight back and damage your ship.

The many inovations in GROTNIK WARS make you feel that you are actually piloting the spaceship instead of just hitting keys, but the feature that gives it life is its real-time animation. As you patrol a galaxy, you see a field of meteors passing you, just as if you were moving through 3 dimensional space. Asteroids appear out of the distance and grow larger as they near you, before drifting past. When you steer the ship, the stars outside veer realistically in the opposite direction. Enemy ships appear from above, below or from the side, receding in size as they speed past. But the hyperspace effect (used to move you to a different part of your galaxy) and explosions must be seen to be believed! Never before has there been anything like it for the Sorcerer!

Cassette $19.95
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GALAXIANS by Martin Sevior

Parents are complaining that they can't use their Sorcerer since the children found the thrills and excitement of the Galaxians.

You can force the children into bed, but will you be able to force the Galaxians into defeat as they dive at you with ever increasing fury. Your Sorcerer's unique high resolution graphics add to the excitement that this game generates. This has proved to be our most popular game.

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SORCERER INVADERS by Martin Sevior

This is one of the best Space Invader games you'll ever see on any Micro-computer. Sorcerer Invaders has proved to be most popular and is similar to the arcade game but with the added advantage of not having a coin slot. Simply a must.

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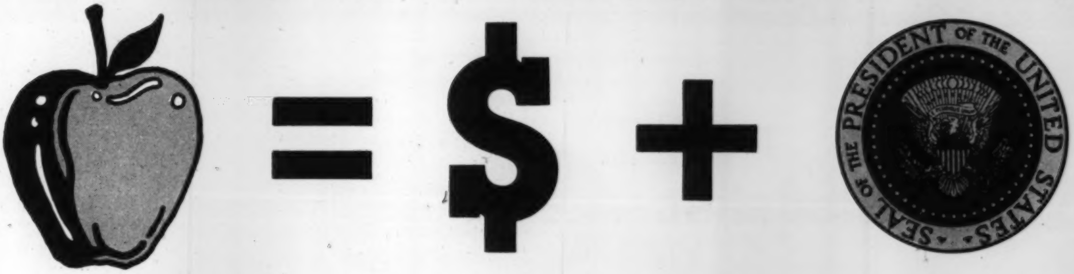
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EXECUTIVE DECISIONS. Armed with up-to-date newswires, market summaries, profit and loss statements, and special memos from department heads, you make the executive decisions. Should you form price cartels with your competitors, or engage in cutthroat practices in an attempt to eliminate them? How should you allocate your vast but limited capital among manufacturing and expansion needs, R&D, and marketing?

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Designed for one to six players, with the computer capable of playing up to five positions, CARTELS & CUTTHROATS provides a full range of options, from simpler games for beginners to an advanced version that will stump even experienced businessmen.

POWER OF THE PRESIDENCY. PRESIDENT ELECT takes into account every major electoral factor to make it the most accurate model of the campaign process ever made. It is the perfect release for the armchair politician in all of us who's wanted to run for the President of the United States.

POLITICAL CLIMATE. You can contest any election from 1960 to 1984 using actual historical candidates or ones you make up.

The computer reflects the political climate of the period chosen based on the prevailing economic factors and U.S. and foreign news. The candidates' political persuasions are determined by their answers (either preprogrammed or player-entered) to over 20 issues as diverse as ERA, the SALT treaty, tax cuts....

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PRESIDENT ELECT is a three-player game representing the Republican, Democratic, and possible third-party candidates. The computer can play any or all three positions.

All you need to play both games are an Apple II with Applesoft ROM card, 48K memory, and a mini floppy disc drive. Each for $39.95, both come with their respective program disc, a rule book, and various player-aid charts.

That's a small price to pay to be on your way to your first million. Or to enter the race for the highest office of the nation.

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Microsoft Olympic Decathlon

Gold Medalist

winner
of the
1980
creative computing
award

George Blank

creative computing
SOFTWARE PROFILE

Name: Olympic Decathlon
Type: Arcade Game
System: Apple II Disk, TRS-80 Model I
Format: Disk or tape
Language: Machine Language
Summary: Olympic Quality
Price: $24.95
Manufacturer:
Microsoft Consumer Products
400 108th Ave. N.E., Suite 200
Bellevue, WA 98004

How many of your friends have an Olympic Gold Medal—the symbol of the very top level of athletic achievement. The most prestigious event in the Olympics is the Decathlon, a series of ten events designed to select the best all-around athlete in the world. It is particularly fitting that one of the finest games ever written for personal computers should be based on the Olympic Decathlon.

How would you pick the world's best computer game? If there were a decathlon for computer games, it might include these ten events.

1. Challenge and skill
2. Excitement and suspense
3. Solitaire play
4. Group play
5. Creativity
6. Showing off your computer
7. Immediate fun
8. Long term enjoyment
9. Graphics and animation
10. Competition

In any one of these ten events, it would be hard to beat Olympic Decathlon. If you consider all ten together, the program is unbeatable. From the opening titles to the announcement of the gold medalist, Olympic Decathlon will captivate your attention, challenge your skill, dexterity, and judgment, and lock you into total competition with your opponents, the computer, and your own best record. The program is so addicting that I recommend buying it right before a long weekend. Otherwise you are liable to be fired for failing to show up for work the next morning.

The game, by Tim Smith, was recognized at the West Coast Computer Faire as the winner of the 1980 Creative Computing Award, for the most creative game of last year.

As you place the diskette in your Apple II or TRS-80 Model I and boot it, or load the TRS-80 cassette version, you see a runner pulling the title across the screen. An animated figure shot-puts the dot over the "i" in Olympic. If you have an Apple, you will also hear the Olympic theme. Then a circle moves down from the top of the screen, divides and forms the five-ring Olympic symbol. Instructions are displayed, and you are asked if you wish to begin the Decathlon.

If you answer no, a menu appears, listing the ten events as follows:

1. 100-Meter Dash
2. Long Jump
3. Shot Put
4. High Jump
5. 400-Meter Dash
6. 110-Meter Hurdles
7. Discus Throw
8. Pole Vault
9. Javelin Throw
10. 1500-Meter Run

You are then asked which event you wish to practice. This gives you a chance to introduce new players to the events and let them try out their skills. It also gives you a chance to gain skill in the most difficult events.

If you answer that you are ready to begin the Decathlon, you are then asked how many people want to play. You can have up to eight players in the TRS-80 version or six players in the Apple II version. The computer then asks for the name of each player.

Once the registration is complete, the computer announces the first event, the 100 meter dash. This event is run in two-player heats, with a display of the track on the screen. Each player moves to the starting line by alternating keys on the keyboard as if his fingers were legs. Then the starter counts down... READY... SET... the GO flag comes out of the starting pistol and the flying fingers of the players move their men across the screen. The speed typist wins this one, as he will also win the 400 meter dash, for only the speed with which two fingers can run on the keys counts.

As each heat is run, the computer schedules the next, until all players have competed. In between events, the computer displays the standings, with point scores based on the Olympic system. Since the game is real time, you can aim to run the hundred in under ten seconds, and possibly even make it!

The second event, the long jump, calls forth a different challenge. The TRS-80 and Apple versions of several events are slightly different, so I will describe the TRS-80 version and occasionally mention some of the differences in the Apple version. For the long jump, the computer asks for the speed of your run-up, from 700 to 1000 centimeters per second. After you answer, a line is displayed on the screen, with a break to represent the foul line. You press the space bar to begin

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POOL 1.5

By Hoffman, St Germain & Morock from IDS
The pressure is on: if you can just get enough english on the ball to bank it into the corner pocket . . . In POOL 1.5, you can! A remarkable action-simulation of the real thing, this program allows full control of your "cue-stick" for aim (265 directions) and control (all types of english). Play four different types of pool at your choice of table speed, and even get an "instant replay" of any shot, in slow motion! Hi-Res color graphics are used throughout this real-time game.

48K Disk...$34.95

DEATH-MAZE 5000

From Med Systems
A new breed of adventuring! Venture through a graphically represented 3-D maze, with halls that could dead end -- or recede to infinity. Step through the doors or drop into the pits. Will you encounter monsters and mayhem, or will you be treated to useful objects and information? Will you ever get out alive?

You may never find your way out of Deathmaze 5000, but you'll keep trying!

32K APPLE II, 16K TRS-80...$12.95

By Lord British from Top of the Orchard
An "adventure" that defies description. Unlike the text-type adventures, ULTIMA allows you to wander through towns, countries and continents using Hi-Res graphics and set-commands. And unlike the usual adventures, your journey spans not only space but time, as well. In ULTIMA, you start in the dungeons-and-dragons era but may progress through the space age and beyond! Whether you are "into" adventures, fantasy role-playing, or arcade games, you won't want to miss playing ULTIMA!

Supplied on two disks, one protected (only one disk drive required). 48K...$39.95

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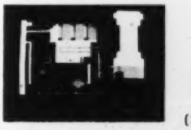
HI-RES SOCCER

By Jay Sullivan from On-Line
Here's a game that let's you really get your kicks! A real-time Soccer game that offers the excitement and challenge of the real thing. You manipulate your eight fully-animated characters against a friend or the computer. Move the ball down field to scoring position, but don't get tackled or your opponent may score against you.

Hi-Res graphics give the kicking, throwing, and corner kicks an absorbing realism, aided by the game clock, scoreboard, and sound effects. Three skill levels allow challenge for beginner through expert.

48K Disk...$29.95

THREE MILE ISLAND



(SPECIAL EDITION)

By Richard Orban from Muse
New machine language version lets you decide whether or not nuclear technology is too complex to handle. The comprehensive documentation describes in detail the operation of the pressurized reactor illustrated in Hi-Res graphics. You must supply electricity -- profitably -- or lose your license to operate. But sloppy operation or pushing too hard may cause a radiation leak . . . or worse!

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SABOTAGE

From On-Line Systems
As commander of an anti-aircraft base, your mission is to clear the skies of enemy planes and helicopters. The opposing forces have other plans. While keeping you busy with a firestorm of bombs, they are dropping paratroopers to sabotage your base!

Quick, machine language animation in Hi-Res color graphics. You can fire conventional or controlled weapons one shot at a time or in rapid sequence. And with auto skill-level escalation, the better you get, the tougher "they" get!

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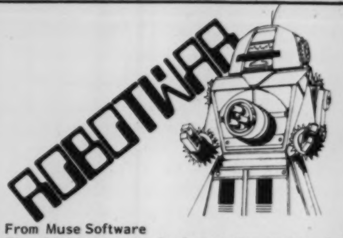

From Muse Software
The thinking person's fast action game. A contradiction? No, RobotWar combines your forethought, programming, and logic to create and condition a robot that will take part in a fast, futuristic gladiator battle!

RobotWar will provide fun and challenge while honing your programming skills. Program your robot in special "Battle Language," debug it on the cybernetic "test bench," and finally watch as your efforts win or lose against up to four competitors on the battle field.

48K Disk...$39.95

ORBITRON

By Eric Knopp from Sirius
Your space station is in a stable orbit, high-energy force fields functioning normally. But what's this? One-by-one, killer satellites begin orbiting your station, preparing to take out your rotating force field -- and you! Fight them off with your weaponry, but don't lose track of the fast-moving meteors. They may be on a collision course.

Sound and fast graphics make ORBITRON a treat; the seven levels of difficulty and bonus point scoring add to the challenge.

48K Disk...$29.95

TRANQUILITY BASE

By Bill Budge from Stoneware
Hi-Res, arcade-type lunar lander offering great fun and a real challenge. As you bring your LEM down, you control it through 360 degrees of rotation. Move horizontally and the moonscape "scrolls" aside beneath you. You pick your site carefully with the aid of the closeup view and try to set your craft down gently, because if you come in too "hot" you're in for a spectacular crash!

48K Disk...$24.95

SANTA PARAVIA

From Instant Software
A classic simulation of government, based in the year 1400 AD. You can play by yourself or compete with up to 6 players as you assume the role of rulers of neighboring Italian city-states. Most of the factors that go into government -- economics, politics, social issues, etc. -- are simulated in this program.

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Decathlon, continued...

your run-up, the down arrow to plant your take off foot, and the enter key to jump.

As you press the space bar, numbers on the screen indicate how far from the foul line your runner is at that instant. Suddenly your runner appears on the screen, running at high speed. When you press the down arrow the runner stops, and a moving line on the screen arcs in front of the runner, creating a rapidly closing angle. When you are ready to jump, you press the enter key, and the angle that was reached determines your take off angle and the length of your jump. Your animated figure sails through the air to a beautiful landing, that is, unless you were too late pressing enter and fell flat on you face! If you were too late pressing the down arrow, you score a foul, and your jump does not count.

The high jump and the pole vault are variations of the first two events, with different animated figures and fouls. In the pole vault, the eighth and most difficult event, you must alternate your fingers rapidly to gain momentum, press the down arrow at the right moment to plant your pole in the box, then, at the right times, press the up arrow to do a handstand on the pole and the clear key to let go of it. If you selected the right place to grip the pole, and ran fast enough, and your timing was correct, you make a successful jump. It took me a week to make my first successful jump at the lowest level!

The third event is the shot put. In this event, you control the amount of force exerted by the arm and shoulder muscles on an animated figure on the screen to put the shot at the perfect angle and momentum. You do this with the right and up arrows on the TRS-80, and with the paddle controllers on the Apple. The Apple version is much harder.

We have already mentioned the fourth event, the high jump, which is about halfway in between the long jump and the pole vault in technique. The fifth event, the 400-meter dash, is just like the 100-meter dash, only longer.

The 110-meter hurdles is the next event. In this, like the dash events, you use your fingers on the keys as if they were legs. Only this time, it is timing, not speed that counts. You have to time your strides perfectly to clear the hurdles and in the Apple version, avoid disqualification, or in the TRS-80 version, break stride and lose time. This event has the cleverest animation, showing a runner actually running and jumping.

The seventh event is the discus throw, a tough event that humiliates the beginner and takes a long time to master. A decent throw may take ten or twelve practice sessions for the first timer. Here, you press the space bar to start the player on the screen rotating and the enter key to let go of the discus. You can choose your speed of rotation and you can let go on the first, second, or third time around. It takes very precise timing to throw the discus straight on the third time around at high speed for an outstanding score.

We have already mentioned the pole vault, event number eight. The ninth event is the javelin throw. Here you must use your fingers to run, pressing the up arrow to tilt your javelin into throwing position (while continuing to run for speed) and press enter to release the javelin. In the TRS-80 version, the javelin sails off screen and you are told how far it went. In the Apple version, the computer switches to a blimp's eye view of the stadium and you watch your javelin sail to a stop in the rich green grass.

creative computing

Tim Smith, left, receives the first annual "Most Creative Game of 1980" award from George Blank, editorial director at Creative Computing magazine. Smith is the author of Olympic Decathlon, the newest game offered by Microsoft Consumer Products. Blank presented the award recently at the West Coast Computer Faire in San Francisco.

The final event is the 1500-meter run. Fortunately, this time you do not run by alternating fingers, but instead steer your runner on the screen by using four keys to set the direction. If you hold the right keys down and don't run into the sides of the track, you build momentum for a good score. However, it is very easy to get confused and score badly.

At the end of the ten events, the computer announces the winner of the gold medal. After lynching him or her, the losers fight over the computer so that they can practice their worst events for a rematch.

I enthusiastically recommend this game. I have been playing the TRS-80 version for over a year, and have moved my own scores from about 4,000 to about 7,000. I have seen scores of 11,000 and higher on the TRS-80 version, while the Apple version is harder.

I am aware of only three significant awards that have been given to microcomputer software. In 1980, Adam Osborne presented the White Elephant Award to VisiCalc, calling it the $150 program that justified the purchase of a $10,000 computer. In 1981, Softalk presented the Softalk award for the most popular Apple program of all time to Super Invasion from Creative Computing software. I had the privilege of serving on the committee and presenting the Creative Computing Award for the most creative game program of 1980 to Tim Smith for Olympic Decathlon. An Apple owner is lucky enough to be able to buy all three. The TRS-80 owner can only obtain VisiCalc and Olympic Decathlon. These are the very finest programs available. ☐

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Five Programs for TRS-80

Bringing Home the Arcade

Owen Linzmayer

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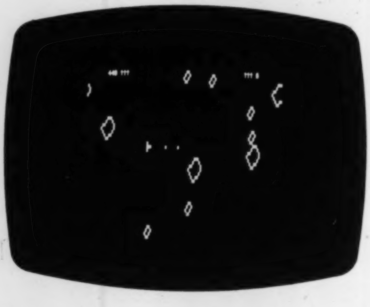
SOFTWARE PROFILE

Name: Galaxy Invasion, Attack Force, Super Nova, Cosmic Fighter, Meteor Mission Two
Type: Arcade Games
System: 16K TRS-80 Model II or III
Format: Disk or Tape
Language: Machine Language
Summary: Top games with high quality graphics
Price: $15.95 each on tape, $19.95 per game on disk
Manufacturer:
Big Five Software
P.O. Box 9078-185
Van Nuys, CA 91409

Super Nova is a TRS-80 version of Atari's popular arcade game, Asteroids. Nova was the link between arcade and TRS-80 for which Asteroids addicts had been waiting. I ordered Nova expecting a good, but slow game that I would be able to tolerate. Boy, was I ever surprised: Nova exceeded my expectations. In fact it was so good, I couldn't wait for the next game from Big Five to appear on the market. To date, Big Five has marketed five quality arcade-type programs all of which are written in machine language by Bill Hogue. Certain features are common to all of the games. They all:

1. Allow two players to compete against each other (one at a time).
2. Keep track of the top ten scores and the initials of the scorers.
3. Give the player a starting allotment of three ships.
4. Award a free bonus ship for each 10,000 points scored.
5. Offer infinite play; as long as one ship is left intact, you may play forever.
6. Have a built-in demonstration mode.



Super Nova

Super Nova is a fast-moving game which requires a great deal of dexterity and quick reflexes.

The program starts with a graphics display which catapults you through space. When the game begins, your ship is situated in the center of the screen. Huge asteroids drift aimlessly through your sector. To acquire points you must shoot at and destroy them. Sounds easy enough, but there is one small catch: the meteors come in three sizes. If you hit a large one it splits into two medium-sized asteroids, which when shot, break into two of the smallest size. These small meteors move quicker and are, thus, harder to destroy. They also carry a higher point value than the larger ones.

You will probably not be able to rest until you know you've conquered the forces of evil and made your galaxy safe.

You can be killed by letting either a stray asteroid or an alien ship collide with your fighter, or by getting hit by enemy fire. There are five types of hostile ships which try to do you in. These range from the slow and clumsy JLK (Jidyan Land Kruiser) to Big Five's trademark, the Flagship. The Flagships carry a secret-weapon, an omnipotent laser bolt cannon which fires a realistic lightning bolt.

To avoid death, you fire at asteroids and enemy ships to destroy them before they get you. Your fighter rotates freely on its own axis a full 360° in 45° increments and is equipped with rocket-thrusters which propel you at amazing speeds. If by

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Owen Linzmayer, 16 Trowbridge Rd., Morris Plains, NJ 07950.

TRS-80 sensational software

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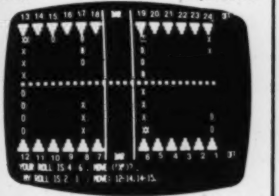
Board Games

Cassette CS-3001 $11.95 6 Programs Requires 8K

Quibic. A 3-dimensional tic-tac-toe type of game played in a 4x4x4 cube. A real challenge.



Backgammon. (by Scott Adams). Excellent graphics and challenging play in this popular game.

Flip Disc. Our version of Othello with three skill levels from good to expert.

Mugwump. Four friendly Mugwumps are hiding on a 10x10 grid. Can you find them all in ten moves?

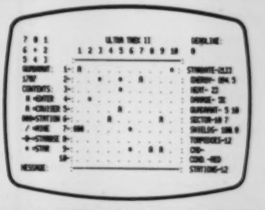
Wumpus. Try to find the Wumpus in a dodecahedron network of caves complete with bottomless pits and giant bats.

Wumpus 2. Five different types of caves or create your own. More hazards too.

Space Games

Cassette CS-3002 $11.95 4 Programs Requires 8K

Star Lanes. The ultimate game of intergalactic commerce and trade for earthbound entrepreneurs.



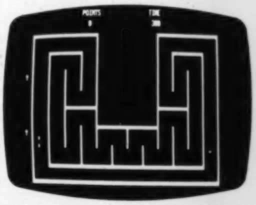
Ultra Trek. Battle klingons with lasers, torpedoes and mines in this real-time game with action graphics.

Romulan. Use your sensors to find the hidden Romulan spacecraft and then destroy it.

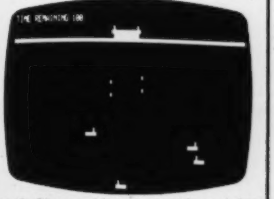
Star Wars. Line up the TIE fighters in your sights and zap them. It's not easy.

Pursuit Games

Cassette CS-3004 $11.95 5 Programs Requires 16K



Stock Car Race. Real-time road racing game around a complex track. Don't blow your engine.



Depth Charge. Move your ship and drop charges to destroy as many subs as possible.

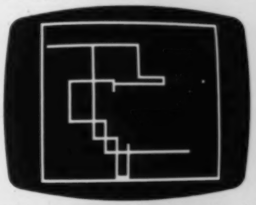
Indy Racer. Real-time with gear changing similar to the popular arcade game.

Maze. Nine skill levels in this high-speed pursuit game.

Kaleidoscope. A ever-changing graphics demonstration.

Strategy Games

Cassette CS-3005 $11.95 5 Programs Requires 16K



Evasion. Try to escape from the snake. It's not easy.

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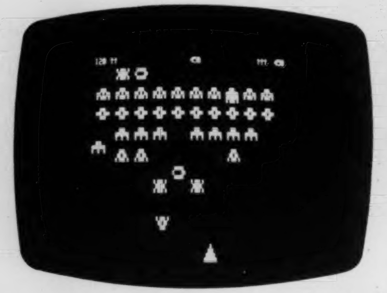
CIRCLE 300 ON READER SERVICE CARD

thrusting, dodging or shooting, you cannot avoid a crash, there is still one desperate last hope, Hyperspace. Entering Hyperspace is dangerous because your place of re-entry is unknown.

Super Nova is as challenging as the arcade version, but is unfortunately missing sound effects. The program has smooth, non-jumpy graphics and is definitely a must for the TRS-80 owner who enjoys Asteroids.

Galaxy Invasion

Galaxy Invasion is the TRS-80 version of Midway's famous "Galaxian" arcade game.



The game begins with your ship sitting directly under a large convoy of invaders. As you glide left and right, methodically destroying the alien ships, small groups of invaders break away from the flock and dive toward your ship. You can almost hear the little suckers inside screaming, "Banzai!" If you shoot a kamikaze alien it is worth twice as much as if it were flying with the pack. If the attacking alien doesn't get shot or ram your ship, it will wraparound to the top of the screen and drift back into its original position.

The Flagships in this game always attack with escorts if possible. The more screens you clear, the more Flagships appear. The Flagships occupy the uppermost row of the convoy, as far away from your laser cannon as possible.

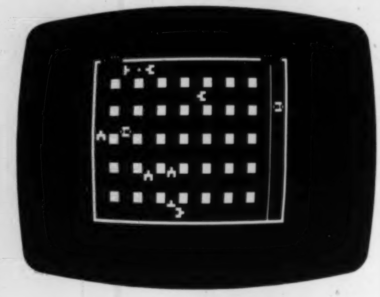
Your demise can take place if you collide with an attacking ship or get hit by a dropped bomb, or you may meet a special death. Occasionally during play, the words "Flagship Attack Alert" flash in the center of the screen. This is to warn you that in a few seconds, the cruel Flagships will unleash their full fury on your little fighter. The only way to avoid being killed is to shoot a Flagship quickly before time runs out. If you don't do this rapidly enough, the Flagships will one at a time open fire on you with their laser bolts, and they always hit—always!

The fleet continues to slide across the screen until you have destroyed all of the alien intruders. The next convoy is a bit quicker, slightly more intelligent and tougher to kill.

Galaxy Invasion, although a big seller, is slower than the other Big Five programs. After 250,000 points the game doesn't increase in complexity to any measurable degree, but is nevertheless quite enjoyable and will keep you fighting over who gets to use the computer.

Attack Force

Attack Force is the TRS-80 version of Exidy's "Targ" arcade game. The object of this game is to maneuver your ship through a death-field of allies formed by 35 blocks arranged in a 7 x 5 matrix.



At the beginning of each board, your ship starts out in the lower right corner and one of the eight enemy ramships is situated at the top of every vertical alley.

You must bob and weave through the back streets and shoot the ramships until the pathways are empty. These ramships cannot return your fire, but can as their name implies, "ram" you to death.

On the right of the field is a thin vertical side street from which your ship is restricted. The feared Flagships are stored there. Once in a while the Flagships will shoot one of the ramships and thus transform it into either another Flagship or a ship identical to yours (if you collide with or shoot this mirror image, you are, in reality, killing yourself).

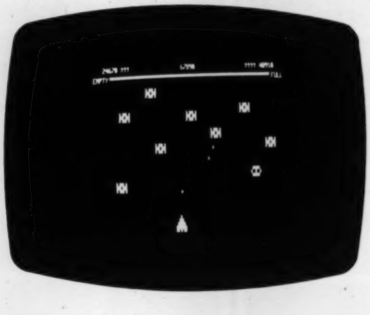
As long as there are still ramships in the maze, Flagships have no special ability, but when all ramships are destroyed, the extra Flagships from the storage area enter the death-field. The commander of these has the ability to fire laser bolts at you from any point in the maze. If you are hit six times by the same Flagship, you are blasted into stardust.

After you have killed all of the enemy ships, the battle is over and you are treated to a dazzling graphics display that fans across the screen. You are then awarded bonus points that increase by 1000 after every battle. The value of each ramship increases by 10 points in the same manner.

It is possible for this game to last forever, but reaching anything over 75,000 points is quite a feat. Attack Force is probably the most challenging of the five programs. If you enjoy beating a game, then try this one on for size, it doesn't give up easily!

Cosmic Fighter

This program is unique among the five because it isn't copied from any one arcade game, although there are traces of Astro Fighter embedded in it. Bill Hogue deserves special thanks for his ingenuity in combining bits and pieces of various games with some ideas of his own to form an exciting home computer game.



As with most arcade games, your ship travels across the bottom of the screen. At the top of the screen is a graphic fuel gauge. If it reaches empty your fighter's fuel tanks won't be able to stand the change in cosmic pressure and will implode, ending the game. Moving and shooting gradually eat away at your fuel reserve.

The first group of aliens sways up and down as they slowly descend toward your ship. You must shoot them as quickly as possible with minimum firing and maneuvering so that you conserve fuel—remember, there is an energy crisis in the cosmos also!

After killing the first set of invaders, another group appears. Four separate groups of aliens comprise an attack wave. When you finally kill off the entire wave, a mothership that resembles a checkered taxicab enters from the right. You must now attempt to dock your ship in the niche in the bottom of this station. If you dock successfully, your ship will be refueled and you will be ready for another attack wave. Hint: a piece of tape correctly positioned on your CRT will aid you in docking quickly.

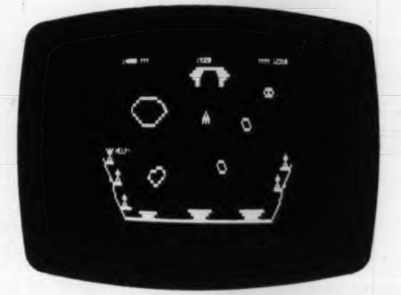
After each of the first four blitz attacks, the aliens build up resistance to your laser fire. On the first wave, one shot blows an enemy away, but on the next attack they take an extra shot before dying; finally they can be killed only if hit four times. But the difficulty is taken into account and these harder-to-kill invaders have appropriately higher point values.

When the player reaches 100,000 points,

the difficulty of the game increases a great deal. It is because of this that a hard-to-reach score is anything over 130,000 points. Cosmic Fighter is one of my favorites.

Meteor Mission Two

As of this writing Meteor Mission II is Big Five's newest entry. There are two different arcade games I have seen which are almost identical to MM II, Lunar Rescue and Escape From Mars.



When the game begins, you are sitting in your rescue pod which is in the hull of a larger mothership. The captain informs you that your mission is to retrieve six stranded astronauts from the ravine below. When the path to the surface looks clear, you release your ship and descend toward the landing pads. Your descent is hindered by a field of slowly moving meteors which, if even gently nudged, will prove lethal.

In the beginning of the game there are three complete and separate landing pads, but whenever you take-off from one, the blast of the lift-off engines deteriorates the surface, thus making the pad smaller, but giving it a higher point rating if you land successfully on it later.

If you manage to land safely, an astronaut runs over to your ship and climbs aboard. Your next task is to get your small craft back into the hull of your mothership, intact.

You must shoot a path through the meteors to the safety above. The speed of ascent can be increased by keeping the firing key depressed. Should you, by skill and/or luck, rescue all six astronauts, you are awarded an extra 1000 bonus points.

The next mission is identical to the previous one except that it is somewhat harder with more numerous and faster moving meteors. And if that's not enough to deter you, another danger is added; occasionally a concentrated asteroid shower will cascade through the sky and devastate your ship if it is in the path of the flying debris.

All of these complications make Meteor Mission II a challenging and captivating game that won't collect dust in your software library. It will probably become one of your favorites.

If you don't own a Big Five program, I urge you to buy at least one, but I must also warn you that you will probably not be able to rest until you know that you've conquered the forces of evil and made your galaxy safe.

As you can see, Big Five has brought much of the excitement, tension and enjoyment of the arcade games to your TRS-80. Now Big Five offers joysticks that attach directly to the TRS-80 Model I to enhance the arcade realism of their games. The joysticks sell for $39.95.

These five programs come on either 16K cassette ($15.95) or 32K disk ($19.95). There is a Model I and a Model III side on each tape/disk. The disk version has a special feature which, after every game, saves the high scores to the disk automatically. These scores are permanent and reappear each time you reload the game.

Big Five offers a 10% discount for two items ordered at one time and a 15% discount for three or more. Add $1.50 for shipping and handling.

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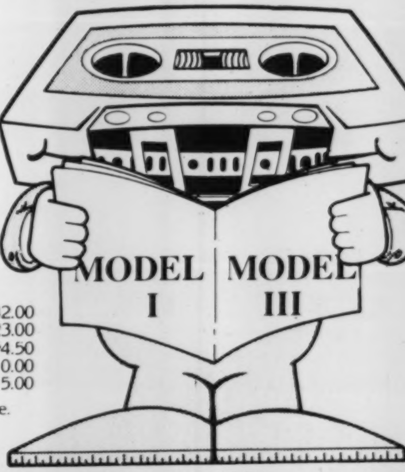

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Three Games for the Color Computer

Colorful Fun

George Blank

Do battle with a fellow dinosaur, lose your sanity in a simultaneous two player game of breakout, or risk a broken leg hurtling down a ski slope in three of the ROM packaged games released by Radio Shack for the TRS-80 color computer. Cleverly using true joysticks as weapons in all three games, Radio Shack battles for the consumer computer market, meeting the Atari 400 and Commodore VIC head on.

Drop Back 300 Million Years and Bite

In Dino Wars, each of two players controls an animated tyrannosaurus rex in a hilarious and noisy battle. The secret of success is to maneuver behind the other dinosaur and bite it. With the joysticks, your dinosaur can maneuver all over the distance, and growing in size as it moves back into the foreground. Strategy can back into the foreground. Strategy can include running off screen to do battle by guess, dodging around a cactus that can throw you or your opponent for a nasty fall, trying to bite the other dinosaur when it is down, or a frenetic circling dance to attempt to get behind the other tyrannosaurus. If the players move off to the side of the screen, the playing field changes, giving a different number of cacti to serve as obstacles, shields, or booby traps.

creative computing
SOFTWARE PROFILE

Name: Dino Wars

Type: Arcade Game

Systam: 4K TRS-80 Color Computer with Joysticks

Format: ROM Cartridge

Language: Machine

Summary: A roaring good time

Price: $39.95

Manufacturer:
Radio Shack
Fort Worth, TX 76102

The sound effects are brilliant, with blood curdling roars as you push the trigger button to make your dinosaur bite, a crashing thud as a bitten or cactus smitten lizard crashes to the ground, and pathetic yelps as the defeated ex Rex of the Paleozoic flees into the sunset. Few people will be able to resist the temptation to turn the volume up to the threshold of pain and relive their ancestry according to Darwin.

The game is a great deal of fun, and is a must for any owner of the Color Computer. It does have a few minor limitations. The battle of the bite is rather two dimensional, and frequently luck rather than skill separates the biter from the bitten. The options for strategy are limited, and while I was still eager to play more when other duties tore me away, I wonder whether it will have lasting challenge and appeal.

Ninety-Nine Years on the Hard Rock Pile

Bustout is Radio Shack's version of the popular arcade game Breakout, and in the tradition of the personal computer market, offers several options. You can choose to play with the brick wall across the top of the screen using gravity effects, or along the right side without gravity. You can play alone, or alternate "balls" with an opponent, or take a short cut to insanity by playing a two player version

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SOFTWARE PROFILE

Name: Bustout

Type: Arcade

System: 4K Radio Shack Color Computer, Joysticks

Format: ROM Cartridge

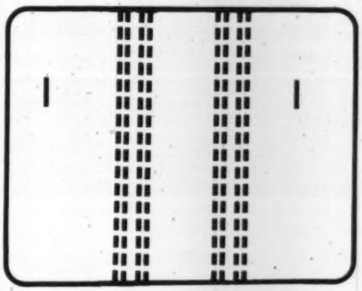
Language: Machine

Summary: Software Breakthrough for the Color Computer

Price: $39.95

Manufacturer:
Radio Shack
Fort Worth, TX 76102

Colorful Fun, continued...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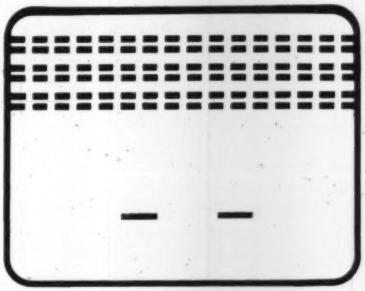
Partners
No Gravity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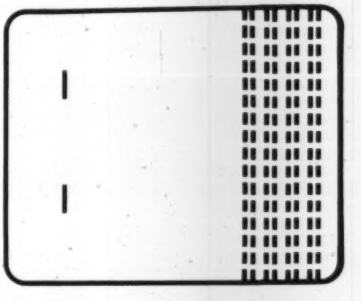
Opponents
No Gravity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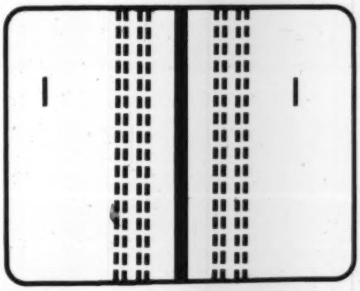
No Gravity


Two Players
Partners
Gravity

on a split screen. You can also play a partnership version with another player, with the wall in the center of the screen and both of you attacking it from opposite sides.

The joysticks make the TRS-80 Color version unique. With full joystick control you can move the paddles close to the wall or fall back, and with the ball moving back and forth across the playing field at very acute angles, you can often get a second chance at a ball before losing it. Of course, if you move the paddle closer to the wall, you run the risk of blocking the ball with the paddle and sending it out of play. But the cleverest touch is the way the game allows you to control the speed of the ball. If the paddle is moving forward when the ball is hit, the ball moves faster, while under opposite circumstances, the ball slows down. Although this is an excellent version of breakout, with some unique virtues, it is also not up to the standard of several other versions. The controls are somewhat sluggish, and the walls are stationary.

Break a Leg—or a Neck!

Our third game, while not quite as good as the first two, is still a good buy, particularly because at $29.95 it costs $10 less than Dino Wars or Bustout. The game of Skiing places you in the position of a downhill racer, moving the joystick from side to side to pass through the gates or stay on the course and forward or back to speed up or slow down. In addition, the trigger button functions as ski poles to give you extra bursts of speed.

While the instruction book talks about options, and it is possible to change courses somewhat, the play of the game is essentially the same. The most drastic difference is whether or not you choose to honor the gates or choose to go for speed alone. In both cases you have the same course and same display. In the speed version, you

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Colorful Fun, continued...

simply ignore the listing of missed gates at the end of the course.

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SOFTWARE PROFILE
Name: Skiing
Type: Sports Game
System: 4K Color Computer with Joystick - 16K recommended
Format: ROM cartridge
Language: Machine language
Summary: Challenge for fast reflexes
Price: $29.95
Manufacturer:
Radio Shack
Fort Worth, TX 76102

The graphics are rather limited, consisting primarily of vertical lines to mark the sides of the course and taller lines with pennants at the top to mark the gates. At the finish line there is a red banner overhead, and a stationary crowd of onlookers that grows larger as you come to a stop in their midst, accompanied by cheering sound effects. In addition to the cheering crowd at the end of the game, other sound effects include a beep when you miss a gate and the snapping of a flag pole if you get too close. Your position is indicated by a single dot at the bottom center of the screen, with the course moving from side to side.

All three games come in ROM packs, which plug conveniently into the side of the computer and eliminate the need for fiddling around with the frustrations and delay of loading programs from cassette tapes. All three also require the purchase of the optional joysticks. While each costs as much as a separate hand held electronic game, even before the cost of computer, television set, and joysticks, the full joystick control and superior graphics make them vastly more fun to play than a hand held game.

How Does the Competition Stack Up?

Arcade games offer the perfect opportunity to compare the TRS-80 Color Computer with its primary competition, the Commodore VIC 20 and the Atari 400. All three are aimed at the same audience; the mass home use market. In features, they lie in between the video games such as Mattel's Intellivision and Atari's Video Computer System and the general purpose color computers such as the Atari 800 and the Apple II. Since one of the most frequent uses of this type of computer in the home is for arcade games, this is a true challenge. However, since people buy these computers instead of dedicated game machines, it is also appropriate to discuss programming and other features.

From an arcade game standpoint, victory has to be awarded to the Atari 400. Despite the superior joysticks of the Color Computer, the playing smoothness and depth of play in Dino Wars cannot equal the same features in Atari's Basketball. Bustout also suffers by comparison with the moving walls and more varied options of the Atari Breakout. The Atari, with its extra microprocessor for handling displays and its custom chips, as well as its special and more expensive faster version of the 6502, simply outclasses the graphics of the Color Computer and the VIC 20. The Atari was designed by a leading manufacturer of arcade games to be a superb game machine. Because Atari felt that interaction with the computer would be primarily through the joysticks, light pen, paddles, and special function keys, the unit was designed with a sealed, touch sensitive keyboard made to withstand spilled drinks and the assaults of peanut butter and jelly. While I do not know the market strategy of Radio Shack, it appears that the Color Computer was designed to offer features similar to the Atari, with a more traditional but still non-standard keyboard, more memory and a better Basic, at a lower price. The Commodore VIC was clearly designed to undercut both of its rivals on price, even to the point of

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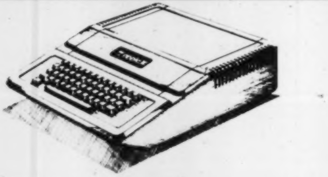

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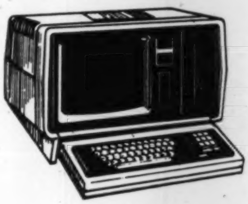

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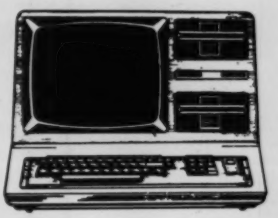

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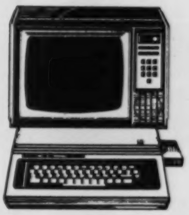

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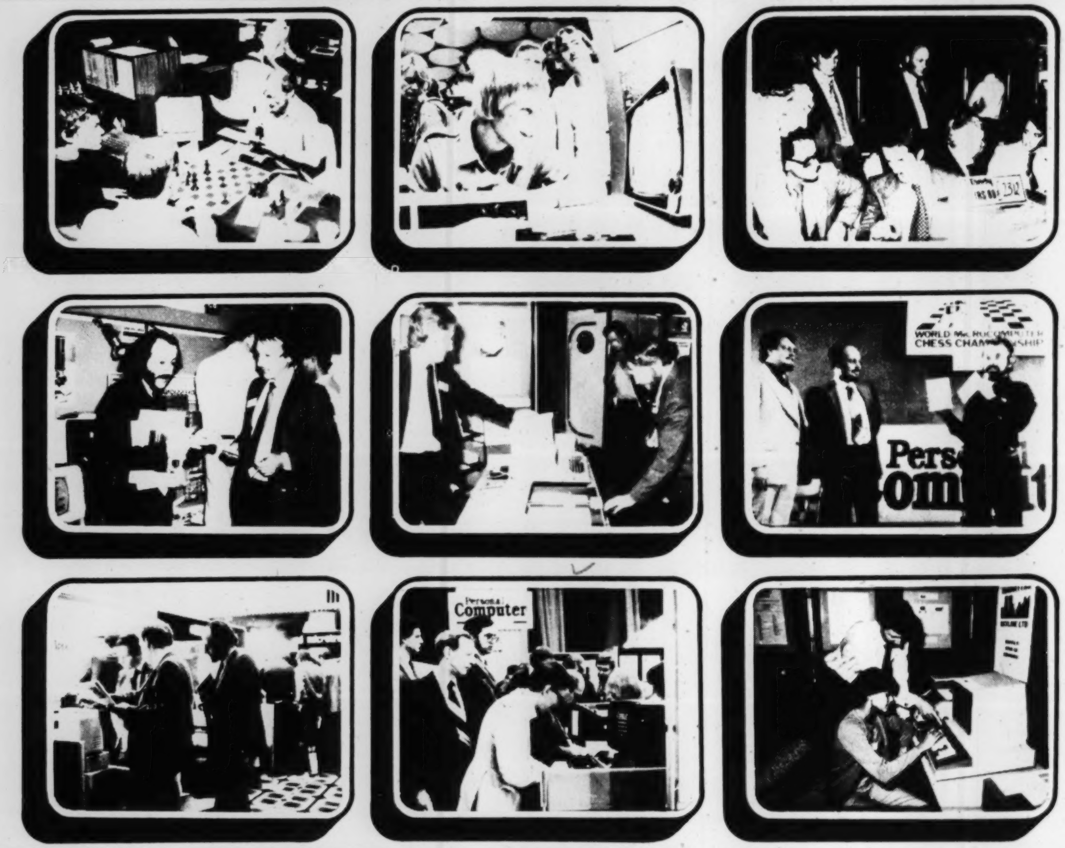
Cunard Hotel London 10–12 September 1981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Feature	VIC 20	TRS-80 Color	Atari 400
Price	$299	$399	$399
Recorder	$ 75	$ 50 (or $0?)	$ 75
Disk	Future?	Percom	Atari
Keyboard	Standard	Square keys	Touch Sensing
Basic	Microsoft 8K	Microsoft 4/12K	Shepherdson 10K
Chip	6502	6809	6502B
Memory	5K	4 to 32K	16 to 48K
Graphics	176 x 184	256 x 192	320 x 192
Expansion	Future	Percom	Atari 800
Software	Little	Good	Excellent
Service	Commodore	Radio Shack	Control Data

Table 1.

designing the whole computer around an inferior, but inexpensive 22 column video interface chip, by whose initials the computer was named. At the same time, Commodore went Radio Shack one better and offered a standard keyboard.

When the VIC was announced at a price of $299, Atari retaliated by lowering its price to $399, the price of the 4K Radio Shack Color Computer, and increasing its standard memory to 16K. Already it is possible to upgrade the Atari 400 to 48K of memory by simply opening the case and plugging in a memory board. At present this must be done using another manufacturer's memory board, though it is no secret that Atari has a 64K board under development, as is also obvious from the number of address lines built into the memory connector. This also allows the Atari 400 to use the disk drives and other accessories available for the Atari 800, and makes it much more flexible than the other two.

The TRS-80 Color Computer uses the Motorola 6809 microprocessor, a more powerful new generation chip that offers some advantages over the 6502 of the VIC-20 and the 6502B of the Atari. This is not quite enough to catch up to the advantages of Atari's custom chips, and costs more than the Commodore approach, so it places the Color Computer between its competitors.

As the Color Computer stands in between in its microprocessor and its keyboard, so it is in memory. It is internally expandable to 32K of memory, more than the 16K that Atari provides presently, but less than the 48K that can be had immediately or the 64K promised in the future. This is way ahead of the VIC, which offers only 5K of memory and is not internally expandable. For those who wish to add disk drives and other peripherals, Percom Data Corporation offers an interface, although this carries the penalty of requiring disk operating system software not supported by Radio Shack and which may not be compatible with future programs.

The VIC, while limited to 5K of user RAM internally, does have some expandability. It is presently possible to add 3K of RAM on a ROM cartridge along with a game in ROM, and an expansion interface is planned for some future date for further memory expansion and disk abilities.

While the VIC is priced at $299, and both of the others at $399, this is misleading. Both the Atari and the VIC require expensive custom tape recorders to store user programs, while the Radio Shack computer allows a standard, inexpensive recorder which many people already own. Since one of the key reasons to buy one of these computers instead of a game computer is programmability, this effectively raises the price of both the VIC 20 and the Atari 400.

A further and significant difference is in the Basic language offered with each computer. Microsoft Basic, such as is offered with the VIC and Color Computer, has proven vastly more popular than other Basics such as Atari's Shepherdson Basic. The TRS-80 offers, as an extra cost but worthwhile option, an extended color Basic by Microsoft that is much better than VIC or Atari Basic. If I were to rate the four Basics for learning purposes, I would pick Radio Shack Extended Color Basic first, followed by VIC Basic, followed by standard Radio Shack Basic, with Atari Basic in last place. Atari does plan to offer an extended Microsoft Basic, superior to even Radio Shack Color Basic, on a 16K ROM cartridge next year. I have a preliminary version of it already, and I like it.

Of further importance for the beginner is the documentation that comes with the computer. Both the Radio Shack and Commodore computers come with outstanding documentation, including a thorough and well done course in Basic. The Atari documentation is less adequate. Although they also provide a Basic course, the book was written before the computer was finished or even before the Basic was finalized, and therefore does not cover the special features of the Atari well.

The Atari enjoys an advantage in software availability since (particularly with 48K of memory) any program written for the 800 will also work on the 400. The Atari has also been around longer and has therefore developed more support. The VIC is partially compatible with the PET, so some programs may be readily converted, though the memory limitations, the narrow screen and the fact that the PET had three mutually incompatible system ROMs limits the number of programs. The TRS-80 Color is not compatible with TRS-80 Basic, but some software houses have started to support it. We can expect that as time goes by the systems which sell well will be supported by outside vendors. At the moment however, Atari holds the advantage.

One final category, that should not be minimized, is servicability. While all three computers are well built and should have few problems, Radio Shack service is readily available almost everywhere and is inexpensive. The Atari is serviced by Control Data Corporation, and is more expensive. Commodore's service policies for the VIC are still not known but the company has not in the past enjoyed a good reputation for customer service on the PET.

In summary, there are valid reasons for picking any one of the three computers over the other two. It is simply a matter of how you evaluate the relative importance of the differences. The chart lists the features of the three computers. ☐

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CIRCLE 161 ON READER SERVICE CARD

Program Modules for the TI 99/4

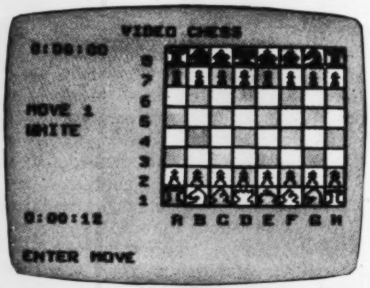
Owen Linderholm

Recently we discovered a library of Command Modules for the TI 99/4 languishing on a closet shelf. The powers that be decreed that I was to review them, so, muttering imprecations under my breath, I reluctantly set to work. To review these modules adequately, I would have had to place myself in the positions of an aging chess master, a six year old child, a thirteen year old video game addict, a homeowner and an overweight, out-of-shape adult. Since I am none of these, I had to settle for the viewpoint of the average person; a difficult task. The following is the result of that endeavor.

Let me begin by stating that all of the modules worked perfectly and gave me no trouble at all. They range in price from $20 to $70 and fall into three categories, education, entertainment and home applications. It should also be noted that the graphics and sound in all of these programs were excellent.

Video Chess

As is usual with chess playing machines, a reasonably good player should not have too much trouble defeating Video Chess. The program does have some very nice features, however. The chess board and pieces are drawn in high-resolution color graphics and actually move around the board instead of simply disappearing and reappearing in their new positions. Some of the options available are different playing levels set by time, not ply search; various styles of play, such as aggressive or defensive; use of the game as a chessboard for two people to play each other; problem solving; simultaneous play by the computer against up to nine opponents; and the ability to save and reload games on cassette.



Video Chess.

Video Chess is quite a good program, especially for the beginning player, and at $69.95, although the most expensive module, it is still a good value.

The Attack

We were given a very big buildup for this game by Texas Instruments. It came with a fancy poster proclaiming the excellence of the game in full color. The game itself was an enormous letdown.

The object of the game is to destroy the alien spore infesting a certain area of space. Some of the spores are floating about, others are contained in indestructible incubators that release them at intervals. If four spores get together, they turn into an alien bug which chases you around until one of you is destroyed.

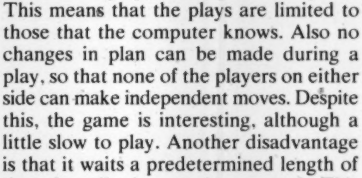
The graphics in the game are very poor considering the ability of the TI 99/4. Morbid music is played at every opportunity and only detracts from the game. The Attack quickly degenerates into a round of running after aliens and blasting them.

Scores mount rapidly, but mean nothing at all, since the average player falls asleep before his ten ships are destroyed. At lower levels of play, the game is too easy and at higher levels it is too difficult, with up to twenty bugs scuttling around the screen after you. It costs $39.95 and is not worth buying.

Football

This game presents a reasonable simulation of football except that each play is predetermined by the player for each side and is then played out by the computer. This means that the plays are limited to those that the computer knows. Also no changes in plan can be made during a play, so that none of the players on either side can make independent moves. Despite this, the game is interesting, although a little slow to play. Another disadvantage is that it waits a predetermined length of time for all plays to be entered. This means that if both sides make up their minds quickly, they must still wait until time is up before play can begin.

Football is more a game of strategy than of quick reflexes or coordination.



Football.

The Sinclair ZX80 is innovative and powerful. Now there's a magazine to help you get the most out of it.

Get in sync

SYNC magazine is different from other personal computing magazines. Not just different because it is about a unique computer, the Sinclair ZX80 (and kit version, the MicroAce). But different because of the creative and innovative philosophy of the editors.

A Fascinating Computer

The ZX80 doesn't have memory mapped video. Thus the screen goes blank when a key is pressed. To some reviewers this is a disadvantage. To our editors this is a challenge. One suggested that games could be written to take advantage of the screen blanking. For example, how about a game where characters and graphic symbols move around the screen while it is blanked? The object would be to crack the secret code governing the movements. Voila! A new game like Mastermind or Black Box uniquely for the ZX80.

We made some interesting discoveries soon after setting up the machine. For instance, the CHR$ function is not limited to a value between 0 and 255, but cycles repeatedly through the code. CHR$ (9) and CHR$ (265) will produce identical values. In other words, CHR$ operates in a MOD 256 fashion. We found that the "=" sign can be used several times on a single line, allowing the logical evaluation of variables. In the Sinclair, LET X=Y=Z=W is a valid expression.

Or consider the TL$ function which strips a string of its initial character. At first, we wondered what practical value it had. Then someone suggested it would be perfect for removing the dollar sign from numerical inputs.

Breakthroughs? Hardly. But indicative of the hints and kinds you'll find in every issue of **SYNC**. We intend to take the Sinclair to its limits and then push beyond, finding new tricks and tips, new applications, new ways to do what couldn't be done before. **SYNC** functions on many levels, with tutorials for the beginner and concepts that will keep the pros coming back for more. We'll show you how to duplicate commands available in other Basics. And, perhaps, how to do things that can't be done on other machines.

Many computer applications require that data be sorted. But did you realize there are over ten fundamentally different sorting algorithms? Many people settle for a simple bubble sort perhaps because it's described in so many programming manuals or because they've seen it in another program. However, sort routines such as heapsort or Shell-Metzner are over 100 times as fast as a bubble sort and may actually use less memory. Sure, 1K of memory isn't a lot to work with, but it can be stretched much further by using innovative, clever coding. You'll find this type of help in **SYNC**.

Lots of Games and Applications

Applications and software are the meat of **SYNC**. We recognize that along with useful, pragmatic applications, like financial analysis and graphing, you'll want games that are fun and challenging. In the charter issue of **SYNC** you'll find several games. Acey Ducey is a card game in which the dealer (the computer) deals two cards face up. You then have an option to bet depending upon whether you feel the next card dealt will have a value between the first two.

In Hurkle, another game in the charter issue, you have to find a happy little Hurkle who is hiding on a 10 X 10 grid. In response to your guesses, the Hurkle sends our a clue telling you in which direction to look next.

One of the most ancient forms of arithmetical puzzle is called a "boomerang." The oldest recorded example is that set down by Nicomachus in his *Arithmetica* around 100 A.D. You'll find a computer version of this puzzle in **SYNC**.

Hard-Hitting, Objective Evaluations

By selecting the ZX80 or MicroAce as your personal computer you've shown that you are an astute buyer looking for good performance, an innovative design and economical price. However, selecting software will not be easy. That's where **SYNC** comes in. **SYNC** evaluates software packages and other peripherals and doesn't just publish manufacturer descriptions. We put each package through its paces and give you an in-depth, objective report of its strengths and weaknesses.

SYNC is a Creative Computing publication. **Creative Computing** is the number 1 magazine of software and applications with nearly 100,000 circulation. The two most popular computer games books in the world, *Basic Computer Games* and *More Basic Computer Games* (combined sales over 500,000) are published by Creative Computing. Creative Computing Software manufactures over 150 software packages for six different personal computers.

Creative Computing, founded in 1974 by David Ahl, is a well-established firm committed to the future of personal computing. We expect the Sinclair ZX80 to be a highly successful computer and correspondingly, **SYNC** to be a respected and successful magazine.

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Needless to say, we can't fill up all the pages without your help. So send in your programs, articles, hints and tips. Remember, illustrations and screen photos make a piece much more interesting. Send in your reviews of peripherals and software too—but be warned: reviews must be in-depth and objective. We want you to respect what you read on the pages of **SYNC** so be honest and forthright in the material you send us. Of course we pay for contributions—just don't expect to retire on it.

The exploration has begun. Join us.

The magazine for Sinclair ZX80 users
SYNC

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CIRCLE 215 ON READER SERVICE CARD

TI Modules, continued...

The graphics and sound are neat and add a great deal. All decisions are made with the clock ticking away, so slow decisions are penalized. Everything considered, the game is a good one. It costs $29.95.

Hunt the Wumpus

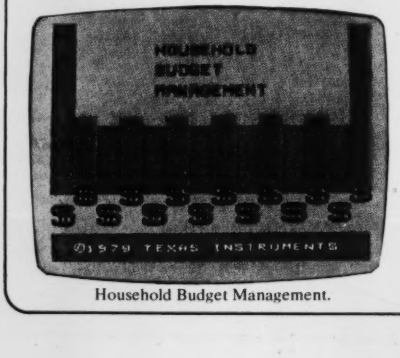
Hunt the Wumpus is loosely based on the Wumpus games in *101 Basic Computer Games* and *More Basic Computer Games* from Creative Computing. The object is to shoot the Wumpus with your single arrow before he eats you or you fall into a pit. The game takes place in a maze. You find the Wumpus by observing whether there are blood spots on the walls of the room you happen to be in at the moment. Blood spots only appear on the walls two rooms or fewer removed from the Wumpus. Options include various difficulties of maze; "blindfold," where you can only see the room or corridor you are in; "express," where you go from room to room without seeing the corridor at all; and finally, "express" and "blindfold" at the same time.

Perhaps the best features of the game are the graphics and sound. They are both very good and make what could be a boring game into one that should be very entertaining for young children.The module costs $24.95 and is quite worthwhile.

Household Budget Management

This module provides a very concise, easy to use and convenient method of keeping track of a personal or household budget. All records can be kept on cassette or disk. The analysis portion of the module is limited, but it does show quite adequately where budget excesses occur and where a little extra money can be spent. Many categories can be defined and the areas in which money is spent can be broken down to individual items if desired. Records are displayed in either graphic or tabular form.

This module provides a good start to mastering the intricacies of household budgeting, and to those of us with few arithmetic or accounting skills it could provide a very useful service. The module costs $39.95.



Household Budget Management.

Physical Fitness

Physical Fitness is a module that designs a course of exercises for you. First, however, your present degree of physical fitness must be ascertained. This is done by measuring your pulse rate (instructions are given) before and after exercising. All exercises are demonstrated by a little mannequin on the screen.

Everything that is done by this module, except for a few little tricks, could be done just as easily and more cheaply with a book on physical fitness and pencil and paper.

The module might be useful for those who have to be bullied or led by the hand in order to follow a regular exercise program. The other advantage of the module is that it does allow you to keep track of your progress by saving records on cassette. The program costs $29.95.

Weight Control and Nutrition

This module attempts to outline a personalized diet for you. The main drawback is that the module will only provide menus and lists of foods that it already knows. This means that a participant following the diet has only a very limited list of foods from which to choose. The diets themselves seem well balanced and probably provide all the necessary vitamins and minerals.

The type of diet and daily intake of calories are determined by the computer based on your present age, weight and height. If the computer thinks that you have unusual requirements, it says so and then goes on to outline the best diet it can manage for you. The module keeps records of changes in weight and food intake on cassette or disk and will change your diet accordingly. Several people can follow diets from the computer at the same time.

Naturally, this program cannot match one provided by a nutritionist, but it does make up menus for each meal and provide recipes, so it might be useful for someone who does not have time to think about the content of his diet. The module costs $59.95, which seems somewhat high considering the limited service it provides.

Video Graphs

Video Graphs is an unusual module in that it seems to be both entertaining and useful. On closer examination, however, it turns out that the serious applications are less useful than they appeared at first glance.

The module provides two modes. One is a dynamic color display mode with five variations, some of which include sound. They have no practical application and initial interest in the displays palls after a very short time.

The other mode allows you to create your own pictures using predefined shapes or by sketching high-resolution pictures. Some very nice pictures can be made with these utilities and the pictures can then be saved on cassette. Unfortunately, all you can do with these pictures is reload them, so they cannot be used in programs. Nevertheless, this is a nice application.

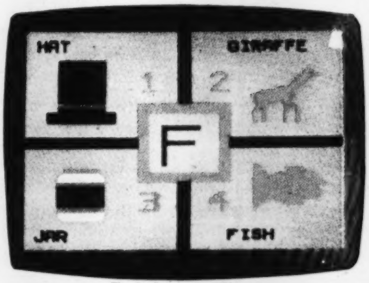
Another feature of this part of the module, is the game of Life in full color. Several predefined shapes are available, or you can create your own.

Despite its limitations, this module should be of interest to any TI 99/4 owner interested in computer graphics. It costs $19.95 and is quite a good value.

Early Learning Fun

This is not one of TI's better educational software packages. The purpose of the module is to teach numbers and letters of the alphabet and generally to improve correlation in the child's mind between shapes and letters and numbers. It can also serve as an introduction to the computer for very young children.

Most of the ideas are sound, but since the instructions are far too complex for a child who cannot even read, it is necessary for an adult to help the child all the time. Each section of the module progresses in a logical order from the last one, and when the entire series of programs is finished, the child should have gained a few ideas about numbers, counting, shapes, colors, letters and the alphabet.



Early Learning Fun.

One of the main disadvantages is that all yes/no answer type questions must be answered by pressing the space bar for yes and the 0 key for no! This is a bit complex for a young child and does not reinforce the idea of associating letters with words. This is not too serious a fault, however, since an adult must be present anyway. The module costs $29.95.

Number Magic

Number Magic is an arithmetic drill for children aged six or over. It consists of a reasonably standard type of program that asks the student to solve a series of problems using addition, multiplication,

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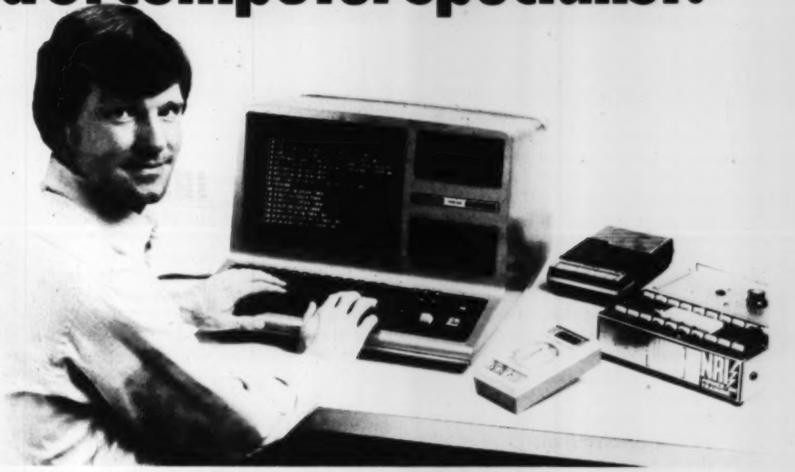

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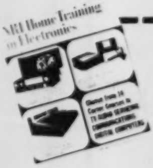

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TI Modules, continued...

division or subtraction. There are various difficulty levels, ranging from very basic problems to extremely difficult ones, and it is possible to race the clock or solve the problems without a time limit. Each test results in a percentage score. Problems can be set up in advance to test a specific area for a particular student.

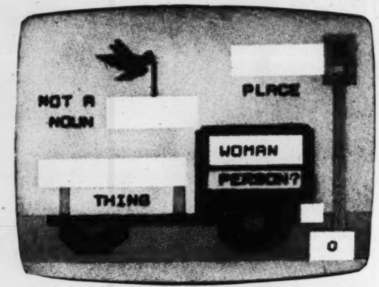
There are also several tests that will help to develop quick responses to arithmetic questions. Problems can be set up to ask for missing numbers or for complete answers.

Despite the extra features of this program it is based on a straightforward and limited type of program and will be of value only as a practice drill. The module costs $19.95.

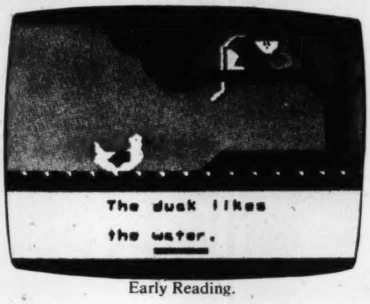
Beginning Grammar

This module is one of the best educational programs I have seen. It teaches elementary rules of grammar and to identification of nouns, verbs, pronouns, adjectives, adverbs, prepositions and conjunctions. The program is crammed with good color graphics and sound. Success is rewarded and failure results in a quick lesson review of the subject matter being tested.

Tests consist of asking the student to identify the type of word required in a sentence. The module does a very good job and should keep the student's interest for long periods. Suffice it to say that this program is all that educational software should be. It contains good graphics, sound and programming. A definite winner!!



Beginning Grammar.



The duck likes the water.

Early Reading.

The module costs $29.95 and is well worth the price.

Early Reading

This is another excellent program from TI and should be of great interest to young children. It should be mentioned that it requires the Solid State Speech Synthesizer from TI to be effective. The program teaches children to read by showing them a picture, then telling them what the picture is by using real speech, then showing them the word for the picture.

The student is then required to find the word in a sentence, then to find other simple words in the same sentence. This is done with several words and then as a reward, the student hears a short story using the words he has learned.

Finally, a comprehension test is given to check that everything is fully understood. There are twelve scenarios available, each of which is very interesting and uses good graphics and sound.

After completing the lessons, the child is given a chance to create his own story by answering simple questions put to him by the computer. Even at $54.95 this module is a good buy.

All of these modules are manufactured by and available from Texas Instruments in Dallas, Texas. ☐

Computer Lawnmower

Can a computer mow your lawn? Not yet.

But a flowchart can show you how to make money cutting five lawns a day. The flowchart is easy. Mowing the lawns is still hard work.

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Flowcharts - A basic concept

They devised flowcharts. They located scores of photos. And they found an artistic high school student to illustrate these concepts with lively full-color drawings.

They then wrote a light-hearted but informative text to tie it all together. It talked about kinds of computers, what goes on inside the machine, the language of the computer and how computers work for us.

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Well-qualified authors

Marion Ball has written other books on computer literacy. Sylvia Charp is the director of educational compuuting for Philadelphia City Schools. They pooled their talents to produce this book, Be A Computer Literate.

This easy-to-read book explains how computers are used in medicine, law enforcement, art, business, transportation and education. It's interesting and understandable.

Too much demand

The Bell System distributed 50,000 copies to schools throughout the U.S. but they couldn't meet the continuing demand. So Creative Computing Press now distributes the book. It's just $3.95 plus $1.00 shipping and handling. Send name and address plus payment or credit card number and expiration date to Creative Computing Press, Morris Plains, NJ 07950. Visa, MasterCard and American Express orders may also be called in toll-free to 800-631-8112 (in NJ 201-540-0445).

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The story behind the two best selling computer games books in the world.

Computer Games

by David H. Ahl

Everybody likes games. Children like tic tac toe. Gamblers like blackjack. Trekkies like Star Trek. Almost everyone has a favorite game or two.

It Started in 1971

Ten years ago when I was at Digital Equipment Corp. (DEC), we wanted a painless way to show reluctant educators that computers weren't scary or difficult to use. Games and simulations seemed like a good method.

So I put out a call to all our customers to send us their best computer games. The response was overwhelming. I got 21 versions of blackjack, 15 of nim and 12 of battleship.

From this enormous outpouring I selected the 90 best games and added 11 that I had written myself for a total of 101. I edited these into a book called 101 Basic Computer Games which was published by DEC. It still is.

When I left DEC in 1974 I asked for the rights to print the book independently. They agreed as long as the name was changed.

Contents of *Basic Computer Games* (right) and *More Basic Computer Games* (below).

Artillery-3
Baccarat
Bible Quiz
Big 6
Binary
Blackbox
Bobstones
Bocce
Boga II
Bumbrun
Bridge-It
Camel
Chase
Chuck-A-Luck
Close Encounters
Column
Concentration
Condot
Convoy
Corral
Countdown
Cup
Dealer's Choice
Deepspace
Defuse
Dodgem
Doors
Drag
Dr. Z
Eliza
Father
Flip
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Geowar
Grand Prix
Guess-It
ICBM
Inkblot
Joust
Jumping Balls
Keno
L Game
Life Expectancy
Lissajous
Magic Square
Man-Eating Rabbit
Maneuvers
Mastermind
Masterbagels
Matpuzzle
Maze
Millionaire
Minotaur
Motorcycle Jump
Nomad
Not One
Obstacle
Octrix
Pasart
Pasart 2
Pinball
Rabbit Chase
Roadrace
Rotate
Safe
Scales
Schmoo
Seabattle
Seawar
Shoot
Smash
Strike 9
Tennis
Tickertape
TV Plot
Twonky
Two-to-Ten
UFO
Under & Over
Van Gam
Warfish
Word Search Puzzle
Wumpus 1
Wumpus 2

Introduction
The Basic Language
Conversion to Other Basics
Acey Ducey
Amazing
Animal
Awari
Bagels
Banner
Basketball
Batnum
Battle
Blackjack
Bombardment
Bombs Away
Bounce
Bowling
Boxing
Bug
Bullfight
Bullseye
Bunny
Buzzword
Calendar
Change
Checkers
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Civil War
Combat
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Cube
Depth Charge
Diamond
Dice
Digits
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Flip Flop
Football
Fur Trader
Golf
Gomoko
Guess
Gunner
Hammurabi
Hangman
Hello
Hexapawn
Hi-Lo
High I-Q
Hockey
Horserace
Hurkle
Kinema
King
Letter
Life
Life For Two
Literature Quiz
Love
Lunar LEM Rocket
Master Mind
Math Dice
Mugwump
Name
Nicomachus
Nim
Number
One Check
Orbit
Pizza
Poetry
Poker
Queen
Reverse
Rock, Scissors, Paper
Roulette
Russian Roulette
Salvo
Sine Wave
Slalom
Slots
Splat
Stars
Stock Market
Super Star Trek
Synonym
Target
3-D Plot
3-D Tic-Tac-Toe
Tic Tac toe
Tower
Train
Trap
23 Matches
War
Weekday
Word

Converted to Microsoft Basic

The games in the original book were in many different dialects of Basic. So Steve North and I converted all the games to standard Microsoft Basic, expanded the descriptions and published the book under the new name Basic Computer Games.

Over the next three years, people sent in improved versions of many of the games along with scores of new ones. So in 1979, we totally revised and corrected Basic Computer Games and published a completely new companion volume of 84 additional games called More Basic Computer Games. This edition is available in both Microsoft Basic and TRS-80 Basic for owners of the TRS-80 computer.

Today Basic Computer Games is in its fifth printing and More Basic Computer Games is in its second. Combined sales are over one half million copies making them the best selling pair of books in recreational computing by a wide margin. There are many imitators, but all offer a fraction of the number of games and cost far more.

The games in these books include classic board games like checkers. They include challenging simulation games like Camel (get across the desert on your camel) and Super Star Trek. There are number games like Guess My Number, Stars and Battle of Numbers. You'll find gambling games like blackjack, keno, and poker. All told there are 185 different games in these two books.

Whether you're just getting started with computers or a proficient programmer, you'll find something of interest. You'll find 15-line games and 400-line games and everything in between.

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Basic Computer Games costs only $7.50 and More Basic Computer Games just $7.95 for either the Microsoft or TRS-80 edition (please specify your choice on your order). Both books together are $15. Send payment plus $2.00 shipping and handling to Creative Computing Press, Morris Plains, NJ 07950. Visa, MasterCard and American Express orders should include card number and expiration date. Charge card orders may also be called in toll-free to 800-631-8112 (in NJ 201-540-0445).

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A Comparison

CP/M Database Management Systems

Glenn A. Hart

Microcomputers have been used for a tremendous variety of tasks ranging from scientific research to environmental control. As hardware has become increasingly dependable and sophisticated, two main areas of specialization have emerged for which the microcomputer is especially suited.

The first applications avenue in which microcomputers have made major inroads against minicomputers and mainframes has been word processing, an application with no serious execution speed requirements and with relatively limited storage needs. Comprehensive word processing software packages, including WordStar, Magic Wand, Spellbinder and many others, rival and in many aspects exceed the capabilities of dedicated word processors costing many times more than a microcomputer hardware/software system. The result has been a dramatic increase in the number of micros in use in business environments.

Recent months have seen increased emphasis on the second application area: use of microcomputers as data base management tools. A data base manager (DBM) is a program system which manipulates collected data, facilitating information entry, updating, additions, deletions and the generation of useful reports.

The utility of such a tool is obviously based on the need to control large amounts of data, since there is not much rationale behind using sophisticated equipment to handle data that could be better maintained on a simple list or perhaps on a limited number of 3" by 5" cards. This fact helps explain the new interest in microcomputer database management. While there have been some usable micro DBM's available for some time (as well as some real clinkers), two main factors have contributed to the recent proliferation of first rate database software.

To some degree the new DBMs are part of the maturation of microcomputers in general. As the number of advanced micros in use increases, software houses find it increasingly easy to justify the major investment in software development time and expense required to produce a competent DBM.

The other contributing element is the increase in microcomputer storage capacity—both volatile memory and archival storage. DBMs often require large amounts of core memory to handle data manipulation and arrays, and the significant reductions in memory cost and the resultant expansion of common memory size have allowed DBM designers to use more sophisticated programming techniques.

The utility of a DBM is based on the need to control large amounts of data.

Even more important is the increasing use of double density formats on floppy disks and the common use of 8", large-capacity drives. Both of these techniques tremendously increase the amount of data which can be on line at reasonable cost. Hard disks are now beginning to be available for microcomputers, and new low-cost, compact fixed disk drives are on the horizon which will dramatically increase affordable storage capacity by one or two orders of magnitude.

There is a large body of theory dealing with database structure and implementation. While there sometimes is not too great a difference in the way databases with different structures can be used, each type has its advantages and weaknesses. The distinctions between relational, hierarchical and other database types are beyond the scope of this article, but since several types are represented in the programs to be examined, some of the operational and functional differences should surface.

The average DBM user may be more concerned with other factors. Most DBMs have some restrictions on record and field size, the number of records a database can contain, whether database definitions can be changed after data has been entered, etc. Other major distinctions involve memory requirements, whether a host language is required, and speed of execution (usually a function of whether the program has been coded in assembly language, a compiled high level language or uses an interpreter). Finally, cost may well be a concern, since the DBMs as a class are probably the most expensive software products available for microcomputers.

This article will examine in some detail several of the newest database managers and related software products designed for use with the CP/M operating system. While there are reasonably competent DBMs for other systems, the large storage requirements of serious DBM use pretty much dictate an operating system with the ability to control large volume core and disk storage. Since DBM has many functions to perform, these programs are often complex (in fact, a major evaluation criterion is the "human engineering" aspect of how easy a DBM is to use). While an article such as this can not examine all the details of each program, it is hoped

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that the reader will be able to evaluate the major functional distinctions between different programs and determine the most suitable one for his specific needs.

```
A = ADD A RECORD                          L = LIST FILE SPECIFICATIONS
B = BUILD A SELECTIVE SUB-FILE            M = FILE MAINTENANCE
C = CREATE A FILE                         P = PRINT REPORTS OR LISTS
D = DISPLAY T.I.M. DIRECTORY             R = RETURN TO SYSTEM
F = FORM LETTER GENERATION ROUTINE         S = SORT A FILE
I = INSPECT, EDIT, OR SEARCH A FILE       X = EXIT T.I.M. PROGRAM
```

Table 1. Main TIM Menu.

Total Information Management

The first DBM we will examine is the Total Information Management system, invariably designated by its acronym TIM. Since many functions are common to all DBMs, we will examine TIM in somewhat more detail than the other programs reviewed to give a general view of what DBMs do.

TIM is written in Microsoft Basic, and is available for either the Version 5.0 or later interpreter or in a completely compiled version which does not require the Microsoft host at all. The system requires 48K of RAM, an 80 x 24 video terminal with clear screen and home functions and a hard copy printer. These requirements are similar to those of the other DBMs to be examined later, except that most other programs require the video terminal to support cursor addressing as well. The program system is comprised of a dozen or so distinct modules, and the large amount of total code really makes multiple drives essential. As with all programs that use the Microsoft Basic Compiler, the executable files in the compiled version are very large. The compiled system cannot be used unless all the compiled files reside on one disk, making 8" double density disks absolutely mandatory.

TIM's record and file limitations are less restrictive than some and not as flexible as others: a data file may contain up to 32,000 records (disk space permitting), but each data record may contain no more than 24 fields. Each field can be no more than 40 characters long, with a total record limitation of 250 characters. TIM stores records as Microsoft strings, and there is no way to program around the limitations inherent in Microsoft's string length. These record limitations occur in many other DBMs, with a record length limitation of around 255 characters rather common. Such a record length is satisfactory for most normal applications, but that is a specification which a potential purchaser should consider carefully.

Human Engineering

One of TIM's strong points is the human engineering that has been incorporated into every aspect of its operation. The program is completely menu driven, meaning that the various options available at any time are clearly displayed. Most commands are single keystrokes, with either upper or lower case accepted. Operator prompts are generally clear and self-explanatory. Such careful design makes for simple user training and easy operation and greatly reduces the need to refer to the program documentation (which is excellent; clear, unambiguous and well organized).

TIM allows data to be stored on disks other than the main program disk. Each disk which the progam will use must be initialized, since TIM maintains a special directory of files stored in TIM format. This directory is *not* the same as the normal CP/M directory, which can be lead to a bit of confusion if the user makes errors. The file name can appear in the normal directory but TIM may not acknowledge its existence. This doesn't happen unless something rather foolish is done.

> ***While there sometimes is not too great a difference in the way databases with different structures can be used, each type has its advantages and weaknesses.***

Once the program is started (with MBasic TIM for the interpreted version or just TIM for the compiled programs), an initial banner is displayed and the next program is loaded. Whenever TIM is loading another program module or is performing some time-consuming function, this information is displayed on the screen, which helps reduce operator anxiety when it appears that nothing is happening. The interpreted TIM can take a while to chain in each new program module due to the internal program design, which passes the value of all variables in the resident program to the next program through Microsoft's ALL parameter to the CHAIN command. Since the Microsoft compiler does not yet support CHAIN with COMMON, the compiled version of TIM writes the variables necessary for the next program out to disk before loading the next module, but the load times for the compiled version are also long because of the large size of the modules themselves.

The main TIM Menu is shown in Table 1. Each of the main functions available can be reached through this menu, and each module returns to this menu upon completion of its task.

Creating a File

The first step is to create a file. As with all DBMs, the system must be told how the data files are organized, what each field's name, length and data type are, etc. TIM recognizes six field types: strings, numbers, dollar amounts, dates, inverted names and calculated fields. Most of these are standard, but the last two are not. Inverted names are a great convenience which allows entering a name in the normal John J. Jones order but which instructs the system to invert the order to Jones, John J. for sorting purposes. This allows names to be arranged in alphabetical order by last name without the necessity of entering them artificially. If this inversion is not needed or desired, a normal string field can be used instead.

Calculated fields are the result of arithmetic manipulation of two other fields or one field and a constant. Thus a field could be designated TOTAL VALUE and be calculated by multiplying ORDER QUANTITY and UNIT PRICE fields. Calculated and number fields may have up to four decimal place precision.

Access to the file can be limited by establishing a four position password. If a password is defined, no operations can be performed in a file without providing the correct input. The password can be changed with the File Maintenance utility.

Records are stored on disk in the order in which they are entered. Any field can be designated a Key Field, which means that the individual records can be accessed in the sorted sequence of the key value. The main, or "major," key can be followed by any number of secondary, or "minor," keys to further specify the exact sorting order desired. TIM creates special key files which contain numbers which are pointers to the next record in the sorted order (either ascending or descending) of the chosen key. This "linked list" method provides fast access to any desired record.

While it is tempting to define *all* fields as keys to handle any possible sorting contingency, a DBM user soon learns that increasing the number of keys results in much slower sorting and merging operations. Most DBMs require that keys be designated only when the file is structured. TIM provides the unusual ability to define keys *after* the file is defined and data has been entered. A sort utility is provided

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for this specific purpose; normally all sorting and merging operations are completely automatic.

A defined format can be stored in a special file called the Create Library. The contents of the library can be recalled at any time to determine the file structure or to use a pre-defined format to create a different data file. TIM maintains such libraries in several of its operating modules, which is convenient in reducing or eliminating the need to keep written records of file layouts.

Once a file structure has been defined and an actual data file created with the Create module, data can be entered with the Add a Record module. All fields to be entered are displayed simultaneously on the screen, with the defined length of each field displayed as a row of dashes. Screen format is quite similar to that used in MicroPro's sophisticated key-to-disk utility DataStar. Entries are checked for appropriate data type and length. Information from previous records can be used again by entering a period, mistakes can be corrected before a field is completely entered by backing up or re-entering the entire record, and the record can be redisplayed after corrections. Null fields (entered with a carriage return) receive all 9's or the ASCII character "<" so they will be sorted to the end of a sort list. Any calculated fields are figured immediately and displayed on the screen. When the record entry is complete the newly entered data are merged into the index files in their proper order.

The merging process can be painfully slow if the number of records entered or the number of previously existing records is large. More time is consumed as the number of key fields increases. While the time required is *much* less for the compiled version, even the faster version is not up to the speeds which can be obtained with some DBMs coded in assembly language (note the "some"; writing in assembly language does not guarantee speed).

Editing

Every DBM has some provisions to inspect and edit individual records. The TIM module for this function is extremely flexible and powerful. A file can be examined either in the order in which it was entered or in order of any key field. Several commands permit jumping around in the file to specified records, moving forward or backward any number of records, etc.

Any record can be located by searching for specific data in any of its fields. TIM allows both sequential and sorted searches, and will automatically choose the most efficient mode. Sub-strings can be input so the entire contents of a field do not have to be entered, but in this case only sequential searching is possible. TIM uses a binary search mode if the search string is complete and the field being searched is a key field, resulting in extremely fast location. Sorted searching will find only the first record meeting the search criterion, while with sequential searching the user has the option of continuing the search. In either case, the located record can be output to the system printer if desired.

A record can be deleted, in which case it is marked as deleted but not removed from the file unless a File Compression utility in the File Maintenance program is used. This allows deleted records to be reclaimed if necessary.

The normal tabular report generation module is very powerful.

Each record is displayed with its complete field titles and the specific data for that record. In addition, the record number, status (deleted or non-deleted), direction (forward or backward movement) and the search mode (sequential or sorted) is displayed. The Beginning-of-File or End-of-File records are also so indicated.

Updating a record is as simple as entering "U" and changing the data in any field. Fields which are to be left unchanged are merely skipped over with a carriage return. If any records are updated, TIM automatically merges the new information into the data file at the completion of the editing process.

A DBM user soon learns that increasing the number of keys results in much slower sorting and merging operations.

An important function of a DBM is to selectively extract specific data from a large data base. TIM's Build a Selective Sub-File module performs this function. Extracted data can be displayed on the user terminal, printed on the system list device or routed to a separate file containing only the desired data. If printed data are requested, TIM prompts for the number of the fields the user wishes to print and outputs a nicely tabulated report. Search criteria can be stored in a Library file for reuse in performing similar extractions in the future or on other data files.

The search criteria can be built using seven types of relational statements. Deleted records or non-deleted records can be specified; these are convenient in determining which records have been marked for deletion prior to compressing the file or for listing only records which have not been so marked. The designated field can be compared to either a constant or the contents of another field using the relational operations GT (greater than), LT (less than), EQ (equal to), NE (not equal to), GE (greater than or equal to), LE (less than or equal to) and BV (between two values). Sub-strings, indicated by the starting and ending positions of a string, can be related to a constant and a string can be searched to determine if it contains a specified constant. These commands can be combined in any complexity, and provide a tremendously flexible searching and extraction facility.

Output

Once all the data have been entered, updated, extracted, etc., the output most often desired is either a report of some kind, mailing labels or form letters. TIM is unique in providing the ability to generate all three kinds of printed output.

Mailing labels are created with the List Generation module (a slightly confusing nomenclature). Up to four labels across can be produced. A label is considered a block of text, and TIM allows defining a block in many useful ways. Each line of a block can contain any field from the data file, truncated to a user specified length if desired, or a constant string for identification purposes. The tabular position of a field or string on each line can also be specified to allow more than one field to appear on each line of a block. A list format can be stored in a List Library for future use.

The normal tabular report generation module is very powerful. The user can specify which fields to include, constant or variable (entered at the time the report is generated) titles and several other factors. TIM will automatically determine the best tabulation and form layout. Three different fields may be summarized and evaluated using a broad spectrum of analytical tools, including sub-totals, grand-totals, minimum/maximum, record counts, mean, variance, standard deviation, etc. These summarizations can be specified for major and minor break points of each of the summarized fields. As usual, a Report Library stores report formats for review and future use.

As if all this were not enough, TIM also includes a usable word processor! While its main purpose is to generate form letters with parameter substitution from a TIM data base, it can also be used for normal word processing (the TIM documentation was prepared completely with the TIM word processing module).

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Microsystems – the CP/M and S-100 User's Journal

CP/M is the software bus! S-100 is the hardware bus for sophisticated microcomputer users!

If you are a CP/M user, on any system—S-100, Apple, TRS-80, Heath, Ohio Scientific, Onyx, Durango, Intel MDS, Mostek MDX, etc—after all CP/M is the Disk Operating System that has been implemented on more computer systems than any other DOS—then *Microsystems* magazine is the "only" magazine published specifically for you!

Or, if you use an S-100/IEEE-696 based computer—and the most sophisticated microcomputer systems available use the S-100/IEEE-696 hardware bus—then *Microsystems* magazine is the "only" magazine published specifically for you!

We started publishing *Microsystems* almost two years ago to fill the void in the microcomputer field. There were magazines catering exclusively to the TRS-80, Apple, Pet, Heath, etc. system users. There were also broad based publications that cover the entire field but no one system in depth. But no magazine existed for CP/M users—nor did one exist for S-100 users.

The why and what of a software bus

First of all what is a "bus?" And why do we call CP/M "the software bus?"

A "bus" is a technique used to interface many different modules. Examples are the "S-100/IEEE-696 Bus" and the "IEEE-488 Bus." These are hardware buses that permit a user to plug a bus-compatible device into the bus without having to make any other hardware modifications and expect the device to operate with little or no monification.

CP/M is a Disk Operating System (DOS). It was first introduced in 1974 and is now the oldest and most mature DOS for microcomputer systems. CP/M has now been implemented on over 250 different computer systems. It has been implemented on hard disk systems as well as floppy disk systems. It is supported by two user groups (CP/M-UG and SIG/M-UG) that have released over sixty volumes containing over 1,600 public domain programs that can be loaded and run on systems using the CP/M DOS. Add to this another 1,500 commercially available CP/M software packages and you have the largest applications software base in existence.

CP/M is the only DOS for micros that has stood the test of time (seven years) with the highest level of compatibility from version to version. And over the years this compatibility has been maintained as new features have been added.

This is why we say "CP/M is the software bus" and why *Microsystems* magazine is vital to providing CP/M users with technical information on using CP/M, interfacing to CP/M, new CP/M compatible products and for CP/M users to exchange ideas.

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The word processor is a bit idiosyncratic, however, in that it stores text as a continuous stream of characters broken into arbitrary lines for disk storage. A document is entered without any returns and with embedded TIM formatting commands, which definitely takes some getting used to. Changing even one word usually results in *all* the disk records after the point of the change being rewritten. This can be slow and cumbersome. TIM's authors point out that the normal use of the module is to produce one or two page form letters, so the storage method and the odd syntax isn't too much of a handicap.

The merging of data from a TIM data file into a form letter works flawlessly and offers good flexibility. Names are handled especially well using the inverted name field provisions. Data fields can also be printed in a tabular format, which can be useful for invoices or special letters. User defined strings can be entered into the form letter as it is printing for special applications.

While the TIM form letter modules work quite well once they are learned, Innovative Software is aware of the popularity of MicroPro's WordStar and Small Business Associates' Magic Wand word processors. A new module called TIM-MAIL is being offered at an additional 10 percent charge which will convert TIM data files to a form usable by Magic Wand or WordStar's MailMerge utility. This module also works well and provides an added measure of flexibility for users who do not wish to abandon their word processors merely to use TIM's capabilities.

```
ACCEPT
CHANGE
COPY
DELETE
DO WHILE
ELSE
ERASE
IF
INSERT
LOCATE
MODIFY
READ
REMARK
REPORT
RETURN
SET
STORE
UPDATE
APPEND
CLEAR
COUNT
DISPLAY
EDIT
ENDDO
FIND
INDEX
JOIN
LOOP
PACK
RECALL
RENAME
RESET
SAVE
SKIP
SUM
USE
CANCEL
CONTINUE
CREATE
DO
EJECT
ENDIF
GOTO
INPUT
LIST
NOTE
QUIT
RELEASE
REPLACE
RESTORE
SELECT
SORT
TOTAL
WAIT

                    Functions

! (convert to upper case)
$ (substrings)
EOF
INT
LEN
STR
VAL
CHR
```

Table 2. dBase Commands.

The other modules listed on the Master Menu are mainly housekeeping utilities. The "D" command allows inspection of the special TIM directory. The "L" commands lists specifications of a data file, including field definitions, date created, key fields, calculated fields, etc. The Sort module will re-sort a file, which is only necessary when a key field is defined after a file exists. Finally the File Maintenance module handles renaming or deletion of files, displaying the disk directory, changing or eliminating passwords, changing the titles of specific fields and compressing a file by removing records which have been tagged for deletion.

One of TIM's strong points is the human engineering that has been incorporated into every aspect of its operation.

Weaknesses

Like any fine program, TIM has a few weaknesses as well. Only one file can be handled at a time, which prevents the information transfer between files that some other DBMs can manage. No provision is made to translate files stored in some other data format to the format used by TIM. A user with files prepared by Basic, a word processor or some other application program will have to reenter all his data through TIM. Finally, no provisions for data manipulation other than those built into TIM are provided. As we will see, several other DBMs include sophisticated high level language type facilities which greatly expand the capabilities of the system. Nevertheless, TIM is a top-notch program which offers excellent human engineering and very complete data handling in an easy-to-use package at a reasonable price. $400.

Innovative Software, Inc., 8176 Nieman Rd., Shawnee Mission, KS 66214.

dBASE II

dBase II takes an almost completely different approach to data management. There are absolutely *no* menus in dBase; the user's interaction with the system is conversational and direct. In my day-to-day work, I use a Microdata Reality minicomputer. This is a fine unit with many capabilities, but its main claim to fame is its DBM software program named "English" which accepts commands in a format approaching natural language ("verbs" tell the system what action to take, followed by "nouns" and "adjectives" to specify the items to act upon). dBase is quite similar to this excellent program, works in a similar manner and, in fact, offers more functions.

dBase consists of a large number of modules which perform various functions, but the existence of these many programs is transparent to the operator. All communications are through the main dBase program. Using the normal interactive mode, the user simply enters the commands he wants to perform and the system executes them directly. The full list of commands is shown in Table 2.

dBase is written in 8080 assembly language and requires a 48K CP/M system, a printer and a CRT with cursor addressing. Record limitations are much less restrictive than TIM, with 32 fields and a maximum character count of 1000 per record permitted. dBase can also handle up to 65K records per data file, so much large databases can be managed.

Normal database manipulation is very easy. The database definitions are made with the CREATE command, with the user entering field names (up to ten characters), type (character, numeric or logical) and field width and decimal precision. The file definitions can be changed later with the MODIFY command—an unusual and valuable feature. Various commands can be used to enter data. The most often used, APPEND, enters data to a newly defined file or adds data to the end of an existing file. dBase maintains files in its own special format, like most DBMs, but can also read or write CP/M files in either column aligned, fixed position format or the normal comma delimited format produced by most Basics and other high level languages. This is a powerful and convenient feature, since

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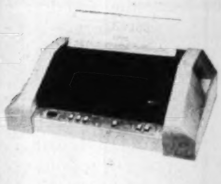

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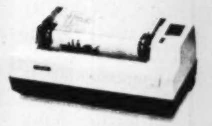

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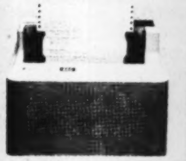

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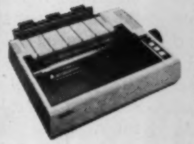

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files from other sources can be translated to dBase format for manipulation without the need for re-entering the data.

Editing

Once data is entered, several commands can be used to make changes. EDIT operates in two modes, depending on whether full screen operations are enabled. Both modes offer advantages in certain circumstances depending on the type and magnitude of editing operations to be performed, and both are very easy to use. Data records can be INSERTed or DELETEd. The DELETE command marks a record for removal but does not actually make the deletion unless the PACK command is executed. This allows the RECALL command to resurrect a deleted record if required.

Other commands are available to handle batch upDATEs (changing specified fields in one database to those in another), CHANGE data in specified columns, REPLACE data fields with a specified value or a calculated change to the existing values (useful for increasing all prices by x%), etc. These commands are very powerful, and allow changes to large databases in a much easier way than laboriously correcting or updating each individual record.

Moving around in a data file is easy with several commands which move to specific record numbers or FIND or LOCATE records based on user specified criteria of almost any complexity. Files can be SORTed with a dBase command. The sort is very fast, but will only operate with one key; to sort a file by multiple keys it is necessary to perform several sorts. More often, the user will elect to INDEX the file, which prepares a separate index file of pointers to records without changing or rearranging the data file itself. A record can be accessed extremely quickly using the index feature.

dBase has the ability to work with two distinct databases more or less simultaneously. While only one can be directly manipulated at a time, another data file can be accessed for data. Several powerful commands allow merging, joining and appending data files together in various combinations, and the combinational operations can be selective if desired.

The basic command to inspect data visually is DISPLAY (LIST is also available and is similar). This command, as most dBase commands, can take many parameters which determine the exact operation performed. For example, to display the name, balance and phone number for all accounts in a data file with balances over $1,000 the command DISPLAY ALL ACCT:NAME,BALANCE,PHONE FOR BALANCE   1000 might be given. DISPLAY can also show the structure of the data file, files on a disk, etc. Other commands can COUNT records, either in total or just those that meet specified criteria, SUM columns, etc.

Output

Written reports are designed by the REPORT command. This is one of the weaker parts of dBase, in that only normal columnar reports can be formatted and the user must specify column locations. dBase saves the report layout in a special file so it can be reused without the need to specify all the parameters again. REPORT will calculate sub-totals and totals for numeric fields but cannot perform any more complicated analysis on the data it prints. While more complex reports can be generated with the high level language features to be discussed next and the current program does what it claims, a more comprehensive report generator would be welcome.

dBase saves the report layout in a special file so it can be reused.

Language Features

dBase includes a comprehensive group of commands which, in essence, implement a high level data manipulation language. The language is reasonably simple to comprehend and use, and is capable of complex data acquisition and manipulation programs, including mathematical and logical calculations. Facilities are included to format screens for data capture, and dBase can store screen layouts in format files for integration into complete programs. The entire language is based on structured programming principles and has some of the constructs necessary to write structured code. Use of the dBase language is definitely *not* for beginners, but experienced programmers can do almost anything that could be done with most free standing high level languages.

The newest version of Selector is clearly an evolutionary step.

Programs can be stored in command files which dBase can execute directly (much like SUBMIT files in CP/M). These files can call other command files to a depth of 16, so highly complex modular programs can be developed for a wide spectrum of applications. Sample programs are included which implement complete financial accounting and mailing list systems

Documentation is reasonably good. The first portion was written by a first time user and gives a good overview of the system from a non-technical viewpoint. Unfortunately, there are several errors in this section and many features are not covered. A more normal reference manual follows, and careful reading of this section is necessary to understand fully the operation of all the commands and features.

Using dBase is fascinating. The interactive access to data is habit forming; the user can find out much about this data by examining it freely. The high level language features are comprehensive and powerful for a knowledgeable user. All in all, dBase is exceptionally interesting and different. $700.

Ashton-Tate Inc., 3600 Wilshire Blvd.,
Suite 1510, Los Angeles, CA 90010.

Selector IV

The Selector series of DBMs dates back almost to the inception of serious use of microcomputers. I can remember marvelling at the then new CBasic semi-compiler and the power and flexibility of a very early Selector version. It's probably fair to say that Selector was the *first* DBM available for micros that was capable of serious use.

Both CBasic and Selector have come a long way since then. CBasic II added many features which made the language more flexible and suitable for business applications, including chaining, the lack of which required the user of early Selectors to load each program module individually. CBasic was widely used because programs could be distributed in the tokenized intermediate form which did not require software authors to reveal their source code, but the language has also been widely criticized for its relatively slow execution.

The newest version of Selector is clearly an evolutionary step. The extensive foundation provided by its ancestors lends an air of maturity to the new version which is obvious. Much of the program structure and command syntax is very similar to the earlier versions, and users of Selector II and III will feel immediately comfortable with Selector IV. The enhancements in the new version are extensive, however, and Selector IV is a far more competent and powerful program.

Selector IV requires a 56K CP/M system with a cursor addressable video terminal and a printer. A simple installation dialog handles system configuration, with 17 common terminals supported directly. Instructions for interfacing other terminals are somewhat confusing, but the method can be figured out after some study.

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DBM Systems, continued...

Like TIM, Selector IV is completely menu driven. (The Master Menu is shown in Table 3). Modules are provided to perform all the standard DBM functions as well as some unique to Selector IV. On screen prompting is widely employed to help guide the user, but the prompts are not terribly self-explantory; they are more reminders of lessons learned only through careful study of the manual.

```
Record Definition              (A)    Data Entry/Recall          (B)
Select/Sort Definition         (C)    Select/Sort Execution      (D)
Line Report Definition         (E)    Line Report Execution      (F)
Page Report Definition         (G)    Page Report Execution      (H)
III-C2 or CBASIC <-> IV        (I)    Build Index File           (J)
File Conversion                (K)    Batch Update               (L)
                         EXIT to System    (X)
```

Table 3. Selector IV Main Menu.

File Definition

The file definition module is straightforward and reasonably easy to use. Selector provides three data types: alphanumeric, numeric and date fields in a variety of formats. Any number of fields can be designated keys, with a subset of the total field as a key if desired to reduce key file length. Selector distinguishes between unique and non-unique keys (a unique key is a field which must contain a value not held by any other record in the file). This distinction can be quite useful, since Selector can be programmed to reject entry of data with preexisting key values. Unique keys also come into play in the multiple file access procedures we will examine shortly. File definitions can be modified, duplicated and printed if desired.

Selector IV records can contain up to 80 fields, but total record length is limited to 255 characters by the CBasic language. Selector data files are stored in fixed position, nondelimited ASCII, which allows access with word processors or external sort programs. A separate key file is maintained with pointers to the location of the actual data.

Data entry is easy, with field headers and lengths well displayed. Extensive cursor addressing results in nicely formatted screens, and several operational conveniences make entry convenient and painless. New data is automatically incorporated into the data base with a CBasic sort, which rearranges the key file only, and a machine language merge module, which is directly invoked by Selector IV for maximum speed.

A complete update module allows sequential or random examination and/or modification of existing data. Portions of keys can be used to locate desired records, and the system again handles merging changed records into the data files automatically.

As in earlier versions, Selector IV provides for the definition of separate command files to create either a sorted pointer list or a group of selection criteria. Various complex procedures can also be incorporated to add flexibility to the command structures, which can be applied singly or in combination to any data file to prepare pointer files based on any fields, not just key fields.

These procedures can also be used in Selector's unusually comprehensive file conversion and update processes. In addition to direct conversions between Selector IV and Selector III and normal CBasic data files, Selector IV can completely convert a data file in any number of ways, including splitting it into two distinct files, adding or subtracting fields, redefining key fields, mathematically manipulating fields, etc. These operations can be controlled by various pointer files to exclude records selectively or to proceed in any designated order.

Interactions can be established among up to six distinct data files. Batch updating is possible, with data files accessing records in unrelated files easily, usually through unique key fields to assure that the exact record desired is modified. This flexibility allows quite complex applications to be structured, and it is possible to envision complete inventory control, order processing and other business systems designed completely with Selector IV. While Selector does not include a separate high level language like dBase and FMS-80, the procedure syntax can perform many of the same functions without quite as much programming knowledge required. This is not to say that using the procedure system is easy; designing the applications is complicated and rather confusing until experiecne clarifies the methodology.

> ***FMS-80 is highly modular and is totally menu-driven.***

Output

Selector includes two report generating modules. One produces columnar reports or labels and the other handles page formatted reports and can produce customized invoice forms, checks, etc. The procedure syntax can also be used with these programs, allowing quite complex report design. The modules which handle report generation are very well done, and design of even complicated reports is quite easy.

In general, Selector IV performs well and is a notable advance over earlier versions. While it is smooth and easy to use, execution speeds are still limited by the use of CBasic. It seems that the newest version is faster than before, but certain operations are noticeably slower than with some of the assembly language DBMs. Nevertheless, Selector IV does everything it claims, which is quite a bit. $550.

Micro-Ap Inc., 1033 Village Parkway, Suite 206, Dublin, CA 94560.

FMS-80

FMS-80 is the most expensive of the four DBMs reviewed here, and perhaps appropriately is the most comprehensive as well. In many respects it is similar in overall structure to Selector IV, but it incorporates and expands upon many of the features of dBase as well.

Written in 8080 assembly language, FMS-80 requires a cursor addressable video terminal and a printer. Configuring the program requires several steps. A parameter file must be set up for the specific terminal to be used; the code for several standard units is included and a reasonably straightforward dialog is provided to handle other terminals. Three other customization files are available. One contains a single line of text which is used to title reports. The second can hold a ten-line block of text which the program displays at start up. The last is a special LOCATE file which gives the program information about the system environment, indicates which disks various types of programs will reside on and sets several system options to the user's preference. The LOCATE file might be a bit confusing to a first time user, but special programs are provided to guide the installer through the options.

The FMS-80 package includes a remarkable program called the Shell. The Shell is named FMS on the distribution disk; when FMS-80 is invoked, the Shell actually gains control, replacing CP/M's standard Console Command Processor (CCP). The main difference is that the Shell will allow chaining and submit-type files from *any* drive, not just drive A:. This can be a tremendous convenience, and is used extensively by FMS-80 to chain programs and execute sequences of instructions. The Shell also handles redirection of input and output and will execute most of the standard CP/M functions directly; 27 Shell calls are available for various purposes. I understand that patches to allow use of the Shell from Microsoft Basic and other common high level languages will be sold separately soon.

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```
 1.     FILE DEFINITIONS MENU
 2.     FILE MAINTENANCE MENU
 3.     FILE REPORTS MENU
 4.     UTILITY
 5.     HELP
 6.     BATCH
 7.     USER MENU
 8.     EXIT FMS-80
```

Table 4. FMS-80 Main Menu.

```
 1.     DEFINE FD
 2.     GLOSSARY
 3.     DEFINE KEYS
 4.     PRINT KEY DEFINITIONS
 5.     SELECT
 6.     PRINT SELECTION
 7.     DEFINE SCREEN
 8.     PRINT SCREEN DEFINITION
 9.     DEFINE REPORT
10.     PRINT REPORT DEFINITION
11.     COMPILE EFM REQUEST
12.     UTILITY
13.     DEFINE MENU
14.     PRINT MENU DEFINITION
15.     FILE MAINTENANCE MENU
16.     FILE REPORTS MENU
17.     FMS-80 MAIN MENU
18.     EXIT FMS-80
```

Table 5. FMS-80 File Definitions Menu.

FMS-80 is highly modular and is totally menu-driven. The main master menu (Table 4) invokes the three main menus which perform most of the standard DBM functions as well as the Utility Menu which duplicates the CP/M Directory, Erase and Rename functions, the Help Menu which accesses special assistance files which the user can easily prepare to guide an operator through system operation and the Batch Menu which can execute prepared command files or directly execute CP/M commands from within FMS-80.

File Definition

The File Definitions Menu (Table 5) handles definition of fields, keys and selection criteria. Most of these modules use the FMS-80 full screen editor. This is an interesting editing program which uses extensive cursor manipulations and very complete operator prompting. Single letter prompts are used with no need to remember complex control key functions. While the basic operation of the editor is always similar, special versions are used for different purposes; in general, the only changes are the specific elements to be entered. The editor is easy to learn and greatly enhances interaction with FMS-80.

```
AUTO            BREAK           CALL
CASE            CLEAR           CLEARLN
CURSE           DEFAULT         DISPLAY
EJECT           ELSE            END
ENDIF           ENDSWITCH       ENTER
ENTERU          ENTERR          ENTERUR
FLUSH           GOTO            IF
IF END          IF ERROR        KREAD
KWRITE          NOAUTO          NREAD
NWRITE          PRINT           READ
RETURN          REWRITE         RMOVE
SHELL           SKIP            STOP
SWITCH          WRITE
```

Table 6. FMS-80 Extended File Management Language Commands.

Record length is virtually unlimited, and multiple keys can be defined. Numeric fields can be formatted with picture strings to enhance entry and provide some data validation. All FMS-80 files are stored in normal ASCII representation, which is an advantage in that editors and other programs can readily access data and control files. Data is stored in fixed position, non-delimited format. The Selection procedures are similar to those in the other DBMs reviewed; normal comparison operators and other selection criteria can be used in several ways.

In addition to these relatively standard functions, FMS-80 allows designing custom screen layouts which can be used for data entry and retrieval and custom user menus to replace those ordinarily used by the system. The definition process for both of these unusual features is interactive and almost self-explanatory. By using custom screens and menus (as well as the HELP files mentioned earlier), turnkey application systems can be designed which don't look anything like a standard FMS-80 package and run smoothly and professionally.

The FMS-80 Report Generator is powerful but rather complex. The user must specify column locations and other information; the program will not automatically assign reasonable values. Multi-line headers and footers can be designed, and a very comprehensive set of field break, page break and end of report processors are available to handle almost any columnar report. While much of FMS-80 is simple to use, the Report Generator takes quite a bit of practice to master.

The final major subprogram available on the File Definitions Menu is the EFM compiler. Like dBase, the FMS-80 package includes a high level file manipulation language called Extended File Management. EFM is extremely powerful, and allows complex file handling and data management well beyond the already comprehensive capabilities built into FMS-80 itself. The language contains some structured programming constructs (see Table 6), but is a bit less structural than dBase. The basic language unit is a field within a data record, and most of the language deals with reading, manipulating and writing such fields and records. Full random, indexed and sequential access is provided. Sufficient flexibility is included to handle many tasks which could not otherwise be managed, but, as with dBase's high level language, only an experienced programmer will be able to use this power. Two full disks of sample programs are provided, many of which are quite useful in their own right, including conversions to WordStar's Mail Merge format, a rather nice Real Estate Management program, inventory control programs, etc.

The File Maintenance Menu controls updating, generating subfiles according to Select Definitions (the system can build an appropriate file definition automatically if desired, sorting files (with multiple keys) and building index files according to predefined key structures. The Update process allows entering and/or changing data, and can use either the standard FMS-80 format or a user-defined screen. If new data is entered or if changes are made to existing data, FMS-80 executes a series of programs to automatically apply, sort and merge the data correctly. As with the other DBMs, it is not generally necessary to sort files or build indices; FMS-80 handles these chores itself in most circumstances. FMS-80 index files work just like those in the other DBMs; they are pointers to data records and can be designated when data files are requested to allow use of multiple index files sorted in different orders to access the same data file, eliminating the need for sorting the data in many applications.

The File Reports Menu allows a simple printing of a data file without a pre-defined Report Definition, counting data elements which fit a Select Definition (a more cumbersome way of counting items than dBase's direct commands, but useful nonetheless), executing Report Definitions and direct query and update of data files. All these modules work smoothly.

Documentation

The FMS-80 documentation deserves special mention. The normal manual contains a tutorial section designed for first time users which is good in general but fails to explain adequately the complicated Report Generator. A reference section fully details each FMS-80 command, and a lengthy manual is provided for the EFM language and the Shell. The two demonstration disks also include text files which are, in effect, extensions of the manual.

More notably, the creators of FMS-80 are the first to use new technologies to

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help train buyers. Two VHS videocassettes are available, one covering fundamental operations and the other discussing more advanced applications and the EFM language. The cassettes are basically lectures and demonstrations by Paul Rodman, author of FMS-80. He obviously knows his product and is an excellent teacher. The cassettes themselves will definitely *not* win any production awards; they are rather choppy and have distinctly amateurish production values. Despite their production flaws, the tapes are extremely helpful and should be purchased by any FMS-80 buyer. FMS-80 should be commended for this project; videotape is a natural training medium which should be used by more software houses, especially those selling programs as complex as FMS-80 (I can think of several word processors which are getting so complex that this sort of training would be immensely helpful).

All in all, FMS-80 is a truly fine product. Its human engineering is reasonably good for such a complex system and it can be configured to handle a wide variety of customized applications. It operates smoothly and is quite fast. As with dBase, FMS-80 will be most appreciated by programmers and those adept with high level languages, but it can be used readily by those with less expertise. $995.

Systems Plus, Inc., 3975 East Bayshore, Palo Alto, CA 94303.

The creators of FMS-80 are the first to use new technologies to help train buyers.

Summary

TIM, dBase, Selector IV and FMS-80 cover a wide spectrum of price and complexity, but they are far from the complete story. Several other excellent DBMs are available, including Condor, Global, the Configurable Business System, the program generators like Pearl and Creator and many others. To choose among them is difficult indeed.

As is often the case with such comparisons, no clear cut "winner" emerges. Each of the programs has unique features which give it an advantage over the others in a given area. Any one might be the program of choice in specific circumstances, and I have recommended each to clients and associates.

In general, however, certain trends do emerge. The DBMs written in high level languages have record size limitations, offer somewhat less ultimate flexibility and execute somewhat slower, but seem to have some advantage in human engineering and ease of use. The DBMs which include their own high level data manipulation languages can handle almost any conceivable application but require programming expertise to extract maximum benefit.

These programs are far too complex for this review to be anything more than a brief overview of each product, but hopefully I have pointed out some productive avenues to explore further. Since a good DBM can be the cornerstone of so many applications and can often be used more than any other single piece of software, a potential user is urged to evaluate these programs in far more depth before making his purchase. It is comforting to realize that all four of the programs examined here are very good, and any of them will perform well in a wide spectrum of circumstances. ☐

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Equipment and Software Evaluations

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Product and Manufacturer	Type Review	Vol: No./Page	Available
COMPUTER SYSTEMS			
26 Single Board Computers	Comp. Chart	5:11/24	Yes
6 Personal Computers	Comp. Chart	5:11/30	Yes
10 Personal Computers	Comp. Chart	6:12/26	Yes
11 Small Business Computers	Comp. Chart	7:5/26	Yes
Altair 8800	Feature	2:1/13	No
"	Follow up	2:6/25	No
APF Imagination Machine	Feature	6:5/22	Yes
APF PeCos One	Feature	5:7/26	Yes
Apple II	Feature	4:4/28	Yes
"	Feature	6:12/54	Yes
Atari 800	Comparison	6:4/22	Yes
"	Feature	6:6/34	Yes
"	Feature	6:12/56	Yes
Bally Home Computer	Feature	4:5/56	Yes
Compucolor II	Feature	5:9/28	No
"	Feature	5:10/30	No
Heathkit H-8	Feature	4:1/38	Yes
"	Building	5:2/17	Yes
Heath WH-89	Feature	6:4/18	Yes
Heath (New products)	Short	5:12/26	Yes
Hewlett Packard 9815A	Feature	2:5/18	No
IMSAI 8080	Feature	3:1/30	No
Interact Model One	Short	5:8/24	Yes
"	Feature	5:11/36	Yes
Monroe Classmate 88	Feature	5:9/32	No
North Star Horizon	Feature	4:6/54	Yes
Ohio Scientific C2P	Feature	4:3/42	No
Ohio Scientific C2-4P	Feature	6:10/17	Yes
Ohio Scientific C4P MF	Short	5:8/22	Yes
Ohio Scientific Superboard	Feature	5:1/120	Yes
Pet 2001 (Commodore)	Feature	4:4/24	Yes
"	Comparison	6:4/22	Yes
"	Feature	6:12/60	Yes
PolyMorphic 8813	Feature	4:5/44	Yes
Sinclair ZX80	Feature	6:12/28	Yes
Sol-20 (Processor Technology)	Feature	3:3/32	No
Sorcerer (Exidy)	Feature	4:5/33	Yes
"	Feature	5:1/88	Yes
Southwest Technical Prod 6800	Feature	3:1/33	No
Radio Shack TRS-80, Level I	Feature	4:1/35	Yes
"	Manuals, Software	4:3/22	No
Radio Shack TRS-80, Level II	Feature	4:5/48	Yes
"	Feature	6:12/58	Yes
Radio Shack TRS-80, Model II	Feature	5:8/30	Yes
TRS-80 Color Computer	Feature	7:1/16	Yes
TRS-80 Pocket Computer	Feature	6:12/49	Yes
"	Feature	7:6/196	Yes
Tektronix 4051	Feature	2:6/20	No
"	Manuals	3:2/103	No
Texas Instruments 99/4	Feature	5:8/28	Yes
"	Feature	6:3/17	Yes
Video Brain (Umtech)	Feature	4:3/52	No
"	Software	5:3/84	Yes
Wave Mate Jupiter II	Feature	3:3/30	No
Xitan Alpha 2 (TDL)	Feature	3:6/46	Yes
TERMINALS, PRINTERS AND I/O			
Group Review - 6 Printers	Comparison	5:12/28	Yes
9 Printers	Comparison	6:6/20	Yes
7 Printers	Comparison & Chart	7:7/130	Yes
Anadex DP9501 Line Printer	Feature	7:6/22	Yes
Apple 80-column Boards	Comparison	7:4/18	Yes
Apple Silentype	Feature	7:8/17	Yes
Base 2 Model 800 Line Printer	Feature	7:2/30	Yes
Centronics 737 Line Printer	Feature	7:4/11	Yes
Commodore 2022 Line Printer	Feature	6:5/14	No
"	Feature	6:12/64	Yes
Comprint 912 Line Printer	Feature	6:6/90	Yes
Dynatyper (Rochester Data)	Feature	7:7/70	Yes

Product and Manufacturer	Type Review	Vol: No./Page	Available
Epson MX-80 Line Printer	Feature	7:7/66	Yes
Heath H-14 Line Printer	Feature	5:10/34	No
IMSAI VIO Video Board	Feature	5:8/38	Yes
Integral Data Brighter Writer	Feature	5:7/17	Yes
Malibu 160 Line Printer	Feature	5:5/52	Yes
Merlin Video Interface	Feature	4:5/52	Yes
Microline 82 Line Printer	Feature	7:7/74	Yes
MPI 88G Line Printer	Feature	7:4/14	Yes
Programma 80-Grafix Board	Feature	7:6/17	Yes
Radio Shack Line Printer VI	Feature	7:2/26	Yes
SWTPC CT-82 Graphics Terminal	Feature	5:7/20	Yes
SWTPC PR-40 Printer	Feature	5:8/32	Yes
Teletype 43 Terminal	Feature	3:1/29	Yes
Texas Instruments 810 Line Printer	Feature	5:9/38	No
TRS-80 Quick Printer II	Feature	5:11/32	Yes

COMMUNICATIONS PERIPHERALS, MODEMS, ETC.

Microconnection	Feature	7:4/42	Yes
Micromodem 100 (DC Hayes)	Feature	6:3/46	Yes
MicroNet (CompuServe)	Feature	6:3/56	Yes
Potomac Micro-Magic MM-103	Feature	6:3/48	Yes
The Source	Feature	6:3/50	Yes
TNW 2000 IEEE 488/RS232C Interface	Feature	7:6/26	Yes

MASS STORAGE SYSTEMS — DISK, TAPE, INTERFACES

Apple Disk II	Feature	5:3/124	Yes
Beta-80 (Meca)	Feature	6:8/24	Yes
Data Dubber (Peripheral People)	Feature	6:2/32	Yes
Exatron Stringy Floppy	Feature	6:9/60	Yes
Heath H-17 Disk System	Feature	5:9/42	No
Midwest Scientific Floppy Disk	Feature	4:3/44	No
Sel-Tronics Cassette Interface	Short	5:6/124	Yes
TC-8 Cassette Storage System	Feature	7:6/28	Yes
Thinker Toys Floppy Disk	Feature	5:2/24	Yes
TRS-80 Floppy Disk	Comparative	5:3/22	Yes

GRAPHICS ENTRY DEVICES AND PLOTTERS

Apple Graphics Tablet	Feature	7:1/28	Yes
Bit Pad (Summagraphics)	Feature	4:4/43	Yes
Periphicon 511 Image Digitizer	Feature	5:10/25	No
HiPlot Plotter (Houston Inst)	Feature	5:6/28	Yes
VersaWriter	Feature	6:6/92	Yes

MUSIC, SPEECH AND SOUND SYSTEMS

Group Review - 4 Music Systems	Comparison	6:10/26	Yes
10 Music Systems	Comparison	7:2/18	Yes
Ai 1000 Speech Synthesizer	Feature	4:3/36	No
ALF 10-5-9 Music Board	Comparative	4:3/28	No
ALF Apple Music Board	Feature	5:6/102	Yes
Atari Music Composer	Feature	7:1/26	Yes
"	Feature	7:4/28	Yes
Casheab Music Synthesizer	Feature	7:1/30	Yes
Computalker Speech Synthesizer	Feature	4:5/62	Yes
Heathkit/Thomas Electronic Organ	Feature	6:6/54	Yes
Heuristics Speechlab	Feature	5:7/30	Yes
Micro Composer (Micro Music)	Feature	6:2/30	Yes
Micro Music (for TRS-80)	Feature	6:1/34	Yes
Musicraft Devel. System (Newtech)	Feature	6:10/49	Yes
Newtech 6/68 Music Board	Comparative	4:3/28	No
Orchestra-80 (Software Affair)	Feature	7:2/162	Yes
Pet Music Box (Neelco)	Feature	6:6/52	Yes
Software Technology Music System	Feature	3:5/96	Yes
Solid State Music SB-1	Comparative	4:2/28	No
Supertalker (Mt. Hardware)	Feature	5:10/42	No
TI 99/4 Music Maker	Feature	7:8/26	Yes
TRS-80 Speech Synthesizer	Feature	5:6/96	Yes
TRS-80 Voxbox	Feature	6:10/38	Yes

OTHER PERIPHERALS

BSR/Sears Home Controller	Feature	5:11/60	Yes
Chatsworth Mark Sense Card Reader	Feature	6:4/32	Yes
Introl/X-10 Home Controller	Feature	5:11/54	Yes
ROMPLUS+ (Mountain Computer)	Feature	6:7/22	Yes
Terrapin Turtle	Feature	5:3/105	Yes

SOFTWARE — LANGUAGES AND SYSTEMS

Comparison of Basics	Comparative	6:7/28	Yes
"	Comparative	6:12/70	Yes
Basic Etc	Comparative	3:6/50	No
Basex	Feature	6:10/46	Yes
CBasic (Software Systems, Inc)	Feature	5:9/48	No
Cobol: Microsoft vs Micro Focus	Comparative	6:3/20	Yes
CP/M Operating System	Feature	4:6/52	Yes
Cromemco 3K Control Basic	Short Comp	3:5/83	Yes
Dynamic Debugger (CMNJ)	Feature	3:5/26	Yes

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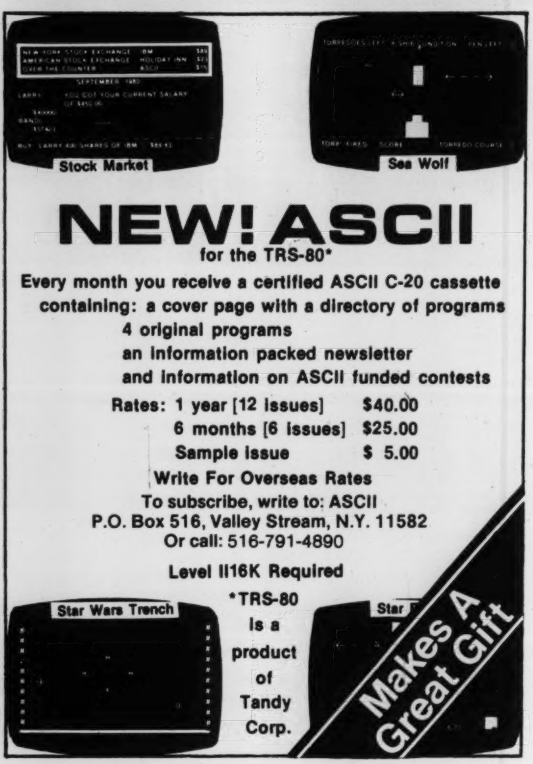

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CIRCLE 119 ON READER SERVICE CARD

Product and Manufacturer	Type Review	Vol: No./Page	Available
EMPL (Micro APL)	Feature	4:2/88	No
Financial Programming Language	Feature	7:5/30	Yes
IMSAI 8K Basic 1.4	Comparative	3:6/49	Yes
Infinite Basic (Racet Computes)	Feature	7:4/26	Yes
The Last One	Short	7:8/24	Yes
Microdos (Percom)	Feature	6:6/26	Yes
Microsoft Basic 4.0	Comparative	3:6/48	Yes
Microsoft Basic 4.0 Extended	Comparative	4:2/84	No
Microsoft Basic 5.0	Short	6:3/40	Yes
Microsoft Fortran 80	Feature	5:1/62	Yes
NEWDOS vs TRSDOS	Comparative	6:1/18	Yes
Palo Alto Tiny Basic	Short Comp	3:5/83	Yes
Pascal (Apple)	Feature	6:12/43	Yes
Pascal (TRS-80 from FMG)	Feature	6:2/24	Yes
Pet Monitor (Home Computer Center)	Feature	5:3/49	Yes
Pilot (for Pet, 4 compared)	Comparative	7:2/158	Yes
Processor Tech 5K Basic	Short Comp	3:5/83	Yes
SAM76 - TRS-80 Version	Short	5:7/114	Yes
SMAL/80	Short	3:5/118	Yes
SWTPC 8K Basic 2.0	Comparative	4:2/87	No
Syskit (for the 8080)	Feature	5:12/34	Yes
Tarbell Basic	Feature	6:1/20	Yes
TI Extended Basic	Feature	7:5/17	Yes
Tiny C	Feature	5:1/68	Yes
"	Short	6:3/40	Yes
TRS-80 Level III Basic	Feature	5:11/42	Yes
6800 Basic's (five)	Comparative	6:1/26	Yes

SOFTWARE — APPLICATIONS

Product and Manufacturer	Type Review	Vol: No./Page	Available
Apple Graphics Utilities	Comparative	7:6/42	Yes
Basic Programmer's Toolkit (for Pet)	Feature	6:7/24	Yes
Channel Data Book (for Pet)	Feature	5:3/26	Yes
Checkbook Maintenance (Computerware)	Feature	5:4/135	Yes
CLOAD Magazine	Feature	4:6/36	Yes
Data Base Management (Cromemco)	Feature	5:3/128	Yes
Data Management (CCA)	Feature	5:3/82	Yes
Desktop/Plan	Feature	6:5/17	No
Electric Paintbrush - TRS-80	Short	5:9/188	No
File Handling - TRS-80 (Circle)	Short	5:7/114	Yes
File-It - TRS-80 (Practical Appl)	Feature	5:3/148	Yes
Instant Software (for Pet)	Comparative	5:1/105	Yes
Interactive Microware	Short	5:4/25	Yes
Investment Analysis Packages	Comparative	7:5/76	Yes
Library 100 (The Bottom Shelf)	Feature	5:4/24	Yes
Mailbag (Systems Design Lab)	Feature	7:7/80	Yes
Mailroom (Software Works, for NorthStar)	Feature	7:5/28	Yes
Mailroom Plus (Peripheral People)	Feature	6:3/36	Yes
Micro Pro Super Sort	Feature	5:7/34	Yes
MUSE Software (for Apple)	Comparative	5:1/104	Yes
Name & Address System (Structured)	Feature	5:6/76	Yes
Pearl	Feature	6:12/68	Yes
Personal Filing System	Feature	7:7/78	Yes
Pet Diagnostics (Commodore)	Feature	5:7/32	Yes
Register (Christianson & Assoc)	Feature	6:1/36	Yes
Satellite Tracking (SatTrak)	Feature	5:12/32	Yes
Softside Software (for TRS-80)	Short	5:1/28	Yes
Speakeasy Software (for Apple)	Comparative	5:1/105	Yes
Statistics (TRS-80 Creative Comp)	Feature	5:12/46	Yes
TR Copy (Data/Print)	Feature	6:11/144	Yes
TRS-80 In-Memory Info System	Feature	5:3/107	Yes
TRS-80 Personal Finance	Short	5:2/103	Yes
Universal Data Entry System	Feature	6:5/102	No
User-Defined Character Generators (for Apple)	Comparative	5:11/38	Yes
VisiCalc	Feature	6:8/26	Yes
WHATSIT Data Base System	Feature	5:4/122	Yes

WORD PROCESSING SYSTEMS AND SOFTWARE

Product and Manufacturer	Type Review	Vol: No./Page	Available
How to select a word processor	Feature	7:7/84	Yes
Apple Writer	Feature	7:7/54	Yes
Auto Scribe	Feature	6:1/24	Yes
Digital Research ED, TEX	Comparative	5:10/50, 5:11/48	No
Easy Writer	Feature	6:10/34	Yes
Electric Pencil	Feature	5:2/30	Yes
"	Comparative	5:10/50, 5:11/48	No
Electric Pencil vs Scripsit	Comparative	7:7/17	Yes
Executive Secretary	Feature	7:7/44	Yes
IDSWord	Feature	5:5/43	Yes
Lazy Writer	Feature	7:7/34	Yes
Lower Case Plus (Lazer)	Feature	7:7/48	Yes
Magic Wand	Feature	6:8/38	Yes
Magic Window (Artsci)	Feature	7:7/59	Yes
Ohio Scientific WP-1	Feature	4:4/131	Yes
Paper Mate (AB Computers)	Feature	7:7/50	Yes
Peachtree Software	Feature	4:4/133	Yes
Pencil Sharpener, Replacement Taker	Feature	6:3/30	Yes
Peripherals Unlimited	Feature	5:5/46	Yes
Scripsit	Feature	6:6/166	Yes
Scripsit, Scripmod, SuperScript	Feature	7:7/26	Yes

Product and Manufacturer	Type Review	Vol: No./Page	Available
Smoke Signal TP-1	Feature	5:1/76	Yes
Sorcerer Word Processing Pac	Feature	6:2/34	Yes
Spellguard (Innovative Software)	Feature	7:7/64	Yes
Super-Text vs Easy Writer	Comparative	6:7/16	Yes
Technical Systems Consultants	Feature	4:4/123	Yes
Edit, PR	Comparative	5:10/50, 5:11/48	No
Text 2000 (Info 2000 Corp)	Feature	4:4/128	Yes
Wordmaster (Micro Pro)	Feature	5:5/50	Yes
Word Master (PolyMorphic 8813)	Feature	5:5/34	Yes
Wordpro 1 vs CMC	Comparative	7:3/26	Yes
Word Processing Printers	Comparative	5:12/28	Yes
Word Star vs Electric Pencil	Comparative	6:2/17	Yes
WPDaisy (TSA)	Feature	5:5/36	Yes
WP6502 (for Ohio Scientific)	Feature	6:10/54	Yes

EDUCATIONAL SOFTWARE

Group Review - 14 Packages	Short	6:9/64	Yes
12 Packages	Short	6:10/56	Yes
11 Packages	Short	7:1/36	Yes
3 Packages	Short	7:3/20	Yes
Bi-lingual Original Adventure	Feature	6:4/80	Yes
Chem Lab Simulations (High Technology)	Feature	6:9/58	Yes
Ecology Simulations - 1	Feature	7:5/218	Yes
" - 2	Feature	6:10/42	Yes
Little Computers, See How They Run	Feature	6:9/78	Yes
Milliken Math Sequences	Feature	6:9/56	Yes
Mind-Memory Improvement Course	Feature	6:6/28	Yes
PDI IQ Builder	Feature	5:5/70	Yes
Pet Educational Cassettes (Peninsula School)	Feature	4:5/68	Yes
Show and Spell (Radio Shack)	Feature	7:3/22	Yes
TRS-80 Math & Algebra Packages	Feature	5:3/58	Yes

RECREATIONAL SOFTWARE

A2-FS1 Flight Simulator	Feature	7:3/28	Yes
ABM	Feature	7:4/30	Yes
Adventures 1-9	Short	7:5/20	Yes
Android Nim	Short	5:6/124	Yes
Appelodian II	Short	5:2/100	Yes
Apple Bowl	Short	6:9/54	Yes
Apple Talker	Short	4:6/46	Yes
Asteroids in Space	Short	6:8/26	Yes
Astrology (Tandy)	Short	6:12/22	Yes
"	Short	7:1/168	Yes
Astro-scope	Short	7:4/36	Yes
Back-40	Short	6:8/160	Yes
Basketball (Atari)	Short	6:8/156	Yes
Beneath Apple Manor	Short	7:6/30	Yes
Bilingual Original Adventure	Feature	6:4/80	Yes
Bridge Challenger	Comparative	6:12/36	Yes
Bulls and Bears	Short	5:1/104	Yes
Bulls/Hits	Short	6:6/170	Yes
Casino I & II	Short	5:1/104	Yes
Chess Tournament (8 systems)	Comparative	7:8/38	Yes
CLOAD Magazine	Feature	4:6/36	Yes
"	Feature	6:7/156	Yes
"	Feature	6:8/160	Yes
Computer Ambush	Feature	6:11/28	Yes
Computer Bismarck	Feature	6:8/31	Yes
Conflict	Short	6:12/22	Yes
Creative Software (for PET)	Feature	5:11/46	Yes
Creative Software (for TRS-80)	Feature	6:1/140	Yes
Creature Venture	Short	7:6/34	Yes
Cubes	Short	6:8/162	Yes
Dancing Demon	Feature	6:10/178	Yes
Death Dreadnaught	Short	7:6/32	Yes
Deathmaze 5000	Short	7:1/14	Yes
Dr. Chips	Short	6:8/162	Yes
Dogfight	Short	7:2/40	Yes
Duelin' Droids	Short	7:3/40	Yes
Dungeon Explorer	Short	6:7/162	Yes
Encounter (for 8080 Systems)	Feature	4:3/56	No
Fracas	Short	7:6/30	Yes
Galactic Attack	Short	7:3/42	Yes
Galactic Saga	Feature	7:4/37	Yes
Galaxy Space War 1	Feature	7:4/37	Yes
Hayden Software (for TRS-80)	Feature	7:4/180	Yes
Hellfire Warrior	Feature	7:3/36	Yes
Hi-Res Football	Short	7:3/42	Yes
Image Computer Products (for Atari)	Short	6:9/182	Yes
Interactive Fiction	Feature	7:2/42	Yes
Jagdstaffel	Short	6:12/22	Yes
The Library 100	Short	5:1/29	Yes
"	Feature	5:4/24	Yes
Lifetwo	Short	6:8/162	Yes
Lords of Karma	Short	7:3/34	Yes
The Maze Game	Short	5:1/104	Yes
The Mean Checkers Machine	Feature	6:7/160	Yes

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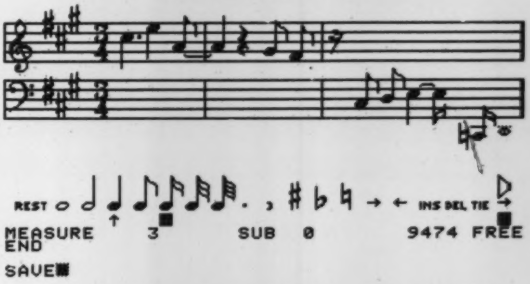

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—Dhahran, Saudi Arabia

I myself have told several people that next to a disk, I consider the [ALF] synthesizer to be the most important peripheral they could purchase for their system. Very excellent job! Keep up the good work.

—Oak Ridge, Tennessee

I recently purchased 2 of your Apple music boards. Out of the peripherals I have for my Apple, I enjoy them the most. It has to be the most enjoyable thing that has ever been invented. I hope you continue to develop products as clever and enjoyable as this one. The Entry program has to be one of the most sophisticated programs I have ever seen. It proves that a hardware manufacturer DOES have the ability to also produce quality software. It is almost worth the price of the boards just for the Entry program.

—Burbank, California

About ease of use:

I have had my Music Card MC1 for a little more than a week now and I have almost completed entering "The Maple Leaf Rag". I found it to be a lot simpler than I thought and so I am very, very pleased. My family isn't because I sit up to all ends of the night playing with the blasted thing!

—Cypress, Texas

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—Demopolis, Alabama

About documentation:

I don't know much about hardware, but I have been a programmer for 15 years and I have never seen a better piece of software documentation than your user manual. It is a joy to study!

—Lancaster, California

About the competition:

Recently, I purchased an [ALF] 9-voice board and a couple of music albums . . . . all I can say is that I wish I had listened and played with it before I purchased the Mtn. Hardware board. It sounds about the same and is vastly superior in software, ease of use, and price. The Entry program is a joy to use and it's easier than Mtn. Hardware's, but then, I guess you guys know that already. (Oh yes, you wouldn't happen to know of anyone that wants to buy a Mtn. Hardware system? $450 or best offer?)

—Kirkland, Washington

I would like to tell you that after having used the system ONLY ONE DAY, that I am absolutely delighted with it. In addition, I purchased the three boards although I ALREADY own Mountain Hardware's music system. Now that I have seen and own your system, I am putting my "old" one up for sale. I think that your software makes it far easier to enter music, and that the software routines allow for far greater flexibility. Again, I extend my compliments to you. As I said, I have owned another music system, and consider myself therefore, qualified to make a judgement between the use of the two. Yours is the clear choice!

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CIRCLE 257 ON READER SERVICE CARD

Product and Manufacturer	Type Review	Vol: No./Page	Available
Micro Movie	Short	6:10/180	Yes
Micro Music	Short	6:10/180	Yes
Microchess 1.5	Feature	5:1/78	Yes
"	Short	5:2/102	Yes
"	Comparative	5:10/68	No
Microsail	Short	6:12/22	Yes
Microtrivia	Short	5:1/104	Yes
Mission Asteroid	Short	7:5/22	Yes
Mystery Mansion	Short	7:5/22	Yes
Oldorf's Revenge	Short	7:6/34	Yes
Olympic Decathlon	Short	7:4/32	Yes
Organ	Feature	6:9/188	Yes
Original Adventure (Microsoft)	Feature	6:5/20	No
Othello Tournament (4 packages)	Comparative	7:7/94	Yes
Peninsula Software (for PET)	Short	4:5/68	Yes
The Prisoner	Short	7:3/34	Yes
Programma Games (for TRS-80)	Feature	6:11/186	Yes
Quick, Watson	Short	5:5/129	Yes
Rocket Pilot	Short	6:9/54	Yes
Santa Paravia and Fiumaccio	Short	7:4/222	Yes
Sargon	Comparative	5:10/68	No
Sargon II	Short	6:3/152	Yes
Scrambled Eggs	Short	5:7/117	Yes
Snake Eggs	Short	6:8/162	Yes
Sorcerer Games (Quality Software)	Feature	7:2/36	Yes
Soundware	Short	5:12/154	Yes
Space Invaders (Atari)	Short	7:4/32	Yes
Star Raiders	Feature	6:6/162	Yes
A Stellar Trek	Short	6:10/32	Yes
Stimulating Simulations	Short	5:2/103	Yes
Super Invader (Creative Computing)	Short	6:4/126	Yes
Super Pro Football	Short	6:9/54	Yes
Super Star Wars	Short	6:9/54	Yes
Sideshow	Short	5:1/104	Yes
Sword of Zedek	Short	7:6/32	Yes
Tankwar (MUSE)	Short	5:1/104	Yes
The Tartaurian	Short	7:6/34	Yes
Temple of Anshai	Feature	6:3/140	Yes
"	Short	7:3/32	Yes
Three Mile Island	Feature	6:3/38	Yes
Time Traveler	Short	7:6/32	Yes
Tuesday Night Football	Short	6:10/32	Yes
Video Checkers (Compu-Quote)	Feature	5:4/137	Yes
The Voice	Short	6:12/22	Yes
The Wizard and the Princess	Short	7:5/22	Yes
War Games (Avalon Hill)	Feature	7:6/36	Yes
The Warp Factor	Feature	7:6/40	Yes
Z-Chess	Short	6:8/160	Yes

ELECTRONIC AND VIDEO GAMES

Group Review - Christmas 1977	Short	3:6/34	Yes
- Christmas 1978	Short	4:6/70	Yes
- Toy Fair 1979	Short	5:5/16	Yes
- Christmas 1979	Short	5:11/12	Yes
- Xmas 1979 (Pt 2)	Short	5:12/17	Yes
- Xmas 1980 (Pt 1)	Short	6:11/24	Yes
- Xmas 1980 (Pt 2)	Short	6:12/17	Yes
Amaze-A-Tron (Coleco)	Short	4:6/71	Yes
APF MP1000 Video Game System	Feature	5:12/24	Yes
Atari Video Pinball	Feature	4:4/35	Yes
Atari Video Computer System	Feature	4:4/37	Yes
1979 Cartridges	Feature	5:10/38	No
Boris Chess	Comparative	5:10/68	No
Checker Challenger	Feature	5:4/120	Yes
Chess Challenger	Short	3:6/35	Yes
Model X	Short	4:6/72	Yes
Level 7	Comparative	5:10/68	No
Code Name: Sector (Parker Bros)	Short	3:6/35	Yes
Comp IV (Milton Bradley)	Feature	3:6/36	Yes
Computer Backgammon	Comparative	4:6/83	Yes
Electronic Battleship (M-B)	Feature	4:3/47	No
Gammonmaster II	Comparative	4:6/83	Yes
Mathemagician (APF)	Feature	4:2/92	No
Mattel Auto Race, Football, Missile Attack	Feature	4:1/27	Yes
Odyssey 200, 300, 400	Feature	2:6/24	Yes
Simon (Milton Bradley)	Short	4:6/71	Yes
Speak & Spell, Spelling Bee (TI)	Comparative	4:5/60	Yes
TEAMMATE Computer (Logix)	Short	4:6/73	Yes
Quiz Wiz (Coleco)	Short	4:6/71	Yes

MISCELLANEOUS

Broder Logic Trainer	Feature	5:3/66	Yes
Compic Computer Portrait System	Feature	5:8/86	Yes
CompuCruise Auto Control	Feature	5:4/132	Yes
Craig M100 Language Translator	Comparative	5:12/20	Yes
Nixdorf Language Translator	Comparative	5:12/20	Yes

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Trucker and Streets of the City

CS-3207 TRS-80 Cassette (32K)
CS-3703 TRS-80 Disk (32K) $24.95

Trucker

This program simulates coast-to-coast trips by an independent trucker hauling various cargos. The user may haul oranges, freight or U.S. mail. All have different risks and rewards. Maximum profit comes from prudent risk-taking.

If all goes well, you can obey the speed limits, stop for eight hours of sleep each night and still meet the schedule. Bad weather, road construction or flat tires may put you behind schedule. You may try to increase your profit by skimping on sleep, driving fast or carrying an overweight load.

Other factors are choice of routes, truck payments, fuel, food, tolls and fines. The simulation is engrossing and informative.

Streets of the City

This simulation is modeled on Grand Rapids, Michigan, a metropolitan area with a population of 550,000. The budgeting, cost and work standard bases are derived from actual experiences of the city over the past five years. The objective of the simulation is to complete a ten-year plan of street and transit improvements while retaining the support of a majority of the City Commission.

During your tenure, you must construct streets and Interstate highways, repair existing streets, and improve traffic safety. For the Transit Authority you have to upgrade and replace a delapidated bus fleet, increase ridership, reduce maintenance downtime and improve on-shedule performance

Other factors to be considered are operating tax levies, construction bonding and labor negotiations. The simulation provides a substantial challenge and it is both educational and entertaining.

Hail to the Chief

by
Phillip W. Brashear
and
Richard G. Vance

CS-3701 TRS-80 Disk, 48K $24.95

Your object in this simulation is to be elected president. In your campaign you set your strategy and carry it out week by week. You may run TV or magazine ads, travel to different states, hold news conferences and participate in a debate.

You must take a position on ten campaign issues such as Energy Policy, Unemployment, Taxes, Mid-East Policy and Strategic Arms Limitations. You must manage your fund raising efforts to business, labor and mass direct mail solicitations.

The package includes four models of varying complexity; each can be used at ten levels of difficulty. The more complex models introduce the influences of incumbancy, campaign finance and spending limits.

Hail to the Chief has been used as a teaching aid in Political Science, Voting Behavior and Computer Science at the University level since 1976. It is a well proven package which includes a comprehensive manual.

3 Adventures

Disk CS-3516 $39.95
Requires 32K

Adventureland (by Scott Adams) You'll encounter wild animals, dwarfs and many other puzzles and perils as you wander through an enchanted world, trying to rescue the 13 lost treasures. Can you rescue the Blue Ox from the quicksand? Or find your way out of the maze of pits? Happy Adventuring!

Pirate Adventure (by Scott Adams)— "Yo Ho Ho and a bottle of rum. . ." You'll meet up with the pirate and his daffy bird along with many strange sights as you attempt to go from your London flat to Treasure Island. Can you recover Long John Silver's lost treasures? Happy sailing matey. .

Mission Impossible Adventure (by Scott Adams)— Good Morning. Your mission is to. . . and so it starts. Will you be able to complete your mission in time? Or is the world's first automated nuclear reactor doomed? This one's well named, its hard, there is no magic but plenty of **suspense**.

Good Luck . .

Voodoo Castle The Count and Ghost Town

Disk CS-3517 $39.95
Requires 32K

Voodoo Castle (by Scott Adams). Count Cristo has had a fiendish curse put on him by his enemies. There he lies, you are his only hope . . . will you be able to rescue him—or is he forever doomed? Beware the Voodoo man.

The Count (by Scott Adams). You wake up in a large brass bed somewhere in Transylvania. Who are you, what are you doing here, and why did the postman deliver a bottle of blood? You'll love this Adventure. In fact, you might say it's Love at First Byte. . .

Ghost Town (by Scott Adams). Explore a deserted western mining town in search of 13 treasures. From rattlesnakes to runaway horses, this Adventure has them all! Just remember, pardner, they don't call them Ghost Towns for nothin! (Also includes a new bonus scoring system.)

Original Adventure

Disk CS-3518 (48K) $19.95

This is the original adventure game complete with a colossal cave populated with nasty little dwarves, a giant clam, trools and much, much more. Includes the SAM76 language in which the game runs.

Adventures on Cassette

Five adventures are available separately on cassette. Each requires 16K and costs $14.95.

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CS-3008 Pirate Adventure
CS-3009 Mission Impossible
CS-3010 Voodoo Castle
CS-3011 The Count

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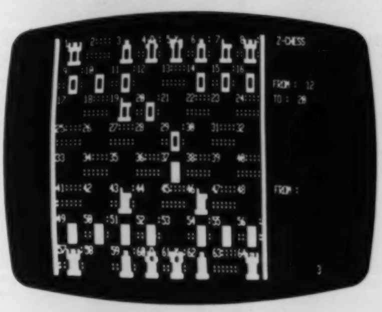
Cassette CS-3006

This fast-moving, real time program puts you in the chair of an air traffic controller. You control 27 prop planes and jets as they land, take off and fly over your air space. You give orders to change altitude, turn, maintain a holding pattern, approach and land at two airports. Written by an air traffic controller, this realistic machine language simulation includes navigational beacons and requires planes to take off and land into the wind. With its continuously variable skill level, you won't easily tire of this absorbing and instructive simulation.

Z-Chess II

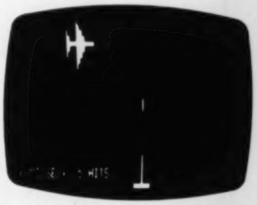
Cassette CS-3017 $19.95 Requires 16K



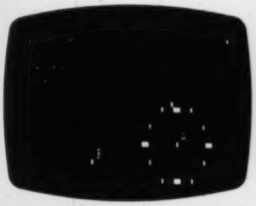
This is one of the most sophisticated computer chess playing programs available today. Seven different skill levels provide practice for the beginner as well as challenge the more experienced players. The speed of Z-Chess will also surprise you. Even at the highest skill level it is one of the fastest chess programs available.

Battle Games

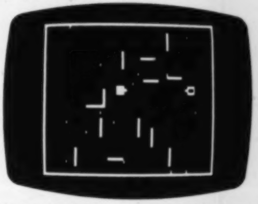
Cassette CS-3012 $11.95 4 Programs Requires 16K



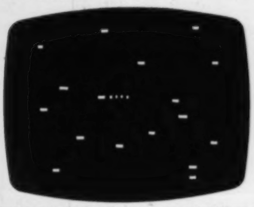
GUNNER. Destroy enemy aircraft with your anti-aircraft gun.



SUB HUNT. Pursue and destroy a computer-controlled submarine.



TANK BATTLE. Two players battle it out in this real-time graphic game.



GETACROSS. Evade the enemy in this real-time, sound game.

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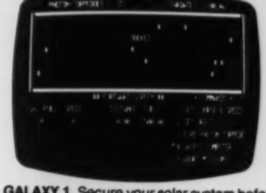

GALAXY 1. Secure your solar system before the enemy threat arrives.

Advanced Air Traffic Controller

Disk CS-3519 (16K) $19.95

This is an advanced version of Air Traffic Controller (Cassette CS-3006) offering additional features and challenge. Available June 1981.

Z-Chess on Disk

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The Top Ten

Good Books for Giving or Getting

Stephen B. Gray

> *We asked Book Review Editor Steve Gray to compile a shopping list of the best books he has reviewed in the past year. So if you are looking to expand your own library or shopping for a gift for your favorite computerists, this is the place to look. The following are reviews of the books recommended by the well-read Mr. Gray.*

The first book is mainly for math teachers, but is also of interest to computerniks. The Dilithium book contains many Basic programs covering a wide variety of tastes.

If you write many programs, the Book of Rules is guaranteed to contain much of value, and it also contains a variety of programs written according to those rules. For a look at the future of all areas of computing, from personal computers to modelling, *The Computer Age* is the book to read.

For those who want a good background in information processing, from I/O devices to security, Marilyn Bohl's textbook is excellent. One of the very best books on TRS-80 Level-II Basic, with built-in progress-checking, is by Michael Zabinski.

If you're still looking around for a computer, the Leventhal book gives excellent advice on what you can do with one, how to program one, and what to buy. Heiserman's book on Basic is excellent, using the slow-and-easy approach and full of excellent exercises.

Bob Perry's volume is one of the most helpful and complete on the subject of selecting a home computer, and also helps you understand networking, videotext, and other such areas. The tenth book is highly recommended if you're thinking of buying a small-business computer; it's a practical guide crammed with helpful details.

Computers in Mathematics: A Sourcebook of Ideas, edited by David H. Ahl. Creative Computing Press, Morristown, NJ. 222 pages, paperback $15.95. 1979.

According to the back cover, this collection of 77 articles from *Creative Computing* is a sourcebook of ideas for using computers to learn about mathematics.

The ten sections are on Introducing the Computer and How to Buy a Microcomputer System; Thinking Strategies and How To Solve Problems; Computer Simulations; Probability; Mathematical Miscellany (progressions, sports predictions, double precision, circular functions, etc.); Art, Graphics and Mathematics; Computer Assisted Instruction; Programming Style; Short Programs; Puzzles, Problems and Programming Ideas.

The book has over 200 problems for assignment, and nearly 100 programs, nearly all in Basic.

My favorite articles are on computing factorials, solving alphametric puzzles (SEND+MORE=MONEY), multiprecision multiplication, double precision, circular functions, trig patterns on printers, "How to Hide Your Basic Program," and several of the short programs.

This book can be recommended, not only for teachers of computer science and mathematics, but for anyone interested in computer math. The reprinted articles are the best to have appeared in this magazine, from the beginnings in 1974 up to 1979.

---

32 Basic Programs for TRS-80 (Level II) Computer, by Tom Rugg and Phil Feldman. Dilithium Press, Box 92, Forest Grove, OR 97116. 282 pages, paperback $15.95. 1980.

Whether or not you like the mix of programs, this book is a model of how such a book should be written and published, and as such is one of Dilithium's best.

For each of the 32 programs, the authors provide sections on Purpose, How to Use it, Sample Run (photographs of the screen, usually), Program Listing, Easy Changes, Main Routines (what the various parts of the program do), Main Variables, and Suggested Projects. The listings and runs are all printed quite clearly.

As for the programs themselves, they are in six groups: applications (biorhythm, checkbook balancing, loan payments, etc.), educational (math drills, metric conversion, vocabulary expansion, etc.), games (a Mastermind lookalike, obstacle race, Wari, etc.), graphics (kaleidoscope and three others), mathematics (least-square curve-fitting, integration, simultaneous equations, etc.), and miscellaneous (approximation of pi, powers of integers, etc.).

The mix is about as good as can be expected, intended to appeal to the widest number of prospective readers, and is much better than several other mixes available in similar books.

What may be unique to this book are the "Easy Changes," which show how to make the program work differently. "You do not have to understand how to program to make these changes," the introduction says. The biorhythm program, for instance, can display the number of days between any two dates if a new line is inserted, and the number of days of the chart shown on the screen can be changed by changing the number in line 360.

The Programmer's Book of Rules, by George Ledin Jr. and Victor Ledin. Lifetime Learning Publications, div. of Wadsworth Publishing Co., 10 Davis Dr., Belmont, CA 94002. 256 pages, paperback $7.95. 1979.

PBR, as the back cover nicknames this book, is a digest of 272 "essential" rules, grouped into 15 chapters. According to the publisher, it covers: knowing the client's needs and solving their problems, choosing the right language for their job, program layout and displaying program output, step-by-step

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program procedures, encoding and debugging procedures, evaluating the program's performance, and references to latest literature by leading authorities.

The 15 chapters are grouped into three parts. Part I, Do It For Your Client, consists of one chapter, on know your clients' needs, and includes rules such as "aim your program at the widest circle of users," sub-rules such as "write as general a program as possible," and sub-sub-rules such as "avoid writing programs that serve only single needs or solve single problems."

Part II, Do It With Style, has four chapters, on Solve the problem, Know your programming language, Make your program layout readable, and Make your output meaningful and useful.

Part III, Do It With Substance, has ten chapters, on Proceed step by step, Use decision and repetition structures, Split your program into subprograms, Be careful with variables and expressions, Avoid indiscriminate jumps, Code and debug your program, Test and edit your program, Utilize software tools, Evaluate your program's performance, and Annotate and document your program.

Examples of programming in Basic, Fortran and Cobol, plus many references and a lengthy bibliography make this a highly useful text for any programmer, even if he remembers only a tenth of the rules.

The Computer Age: A Twenty-Year View, edited by Michael L. Dertouzos and Joel Moses. MIT Press, Cambridge, MA. 507 pages, hardcover $25. 1979.

This look into the next 20 years of computer development and the potential impact consists of contributions by 20 computer authorities such as Terry Winograd, who wrote about "convivial computing," Seymour Papert (computers and learning), J.C.R. Licklider (computers and government), Daniel Bell (the social framework of the information society), Roger Noll (regulation and computer services), Robert Noyce (hardware prospects and limitations), Alan Perlis (current research frontiers in computer science), Joseph Weizenbaum (the computer revolution), etc.

"Written for the serious layperson as well as for the professional," the book is divided into five parts: Prospects for the Individual (Winograd, Papert, Licklider, etc.), Trends in Traditional Computer Uses (business and scientific), Socioeconomic Effects and Expectations (Bell, Noll, et al.), Trends in the Underlying Technologies (Noyce, Perlis, et al.), and Critiques (Weizenbaum and two replies to his piece).

The book starts with The Computer in The Home, by one of the editors, Moses, who presents current and future glimpses of home computing, and discusses the issues of privacy and government regulation. Computer art is discussed in The Return of the Sunday Painter.

Authors discuss automation, conferencing, learning, information services, modelling, economics, sophisticated software, and a dozen other subjects in a language easily understood by anybody interested in getting a wide perspective on the world of computing. This is the best general book I've seen so far on the subject.

Information Processing, by Marilyn Bohl. Science Research Associates Inc., Chicago, IL. 507 pages, paperback $12.95. Third edition, 1980.

This third edition of a book first published in 1971 by SRA, a subsidiary of IBM, is used by "several hundred colleges and universities," according to the preface.

It is one of the most handsomely produced books on the subject of information processing in recent years. The many well-chosen photographs, flowcharts, drawings and other forms of artwork are all carefully integrated with the text.

The 17 chapters are on An Introduction to Data Processing, An Electronic DP system, Data Representation, Data-Recording Media, I/O Devices, Storage Devices, The CPU, Computer Operations, EDP Systems, Developing a Program, Programming Techniques, Programming Languages, Operating Systems, Files and Data Bases, Advanced Systems Concepts, Data Communications, and Computer Security and Controls.

As the chapter titles indicate, the book covers a wide range of topics. Each chapter ends with discussion topics and references for further reading.

The text, although detailed and well done, is written in a style that is workmanlike rather than conversational.

It can also be recommended to anyone who wishes to learn a great deal about information processing, from WATFIV to flowcharting, from virtual storage to modems.

Introduction to TRS-80 Level II Basic and Computer Programming, by Michael P. Zabinski. Prentice-Hall Inc., Englewood Cliffs, NJ. 198 pages, hardcover $14.95, paperback $10.95. 1980.

If you were to pick up this book in a computer store, you might put it down after looking at the first couple of pages. The preface and introduction are solid masses of type, as is most of Chapter 1, the beginning of which sounds as though written by a computer.

But hold on! Starting with page 6, it suddenly blossoms into a fine book on Basic, with many examples accompanied by highly useful line-by-line comments, excellent flowcharts accompanied by line numbers, and over 200 end-of-chapter exercises with back-of-the-book solutions to the even-numbered ones.

Before long, you realize that Dr. Zabinski has had a great deal of teaching experience. According to the back cover of this book, which is indeed "ideal for the beginner who wants to learn about computers without wishing to become an expert."

The ten chapters are: Your TRS-80 Computer, Specifying Information, Computer Programs, Decisions, Looping, Input-Output, Library Functions, Subroutines, Graphics and Strings. Three appendices provide Error Messages, Reserved Words, and a Basic Glossary.

A feature of this book that may be unique is the presentation, here and there, of lines to be entered into the TRS-80, with space for the reader to fill in both the "anticipated display" and the actual "display." This is a fine progress check.

This could well be the best book on TRS-80 Level II Basic.

Why Do You Need A Personal Computer?, by Lance A. Leventhal and Irvin Stafford. John Wiley & Sons, New York, 287 pages, paperback $8.95. 1981.

This is another in the growing list of fine microcomputer paperbacks from Wiley, and is one of the best on what you can do with a computer, how to program it, and what to buy.

The eight chapters are: Your Own Computer, Components of a Computer, Introduction to Basic Programming, How to Write a Program, Peripherals, Interfacing, Computer Operation and Maintenance, and Selecting a Computer.

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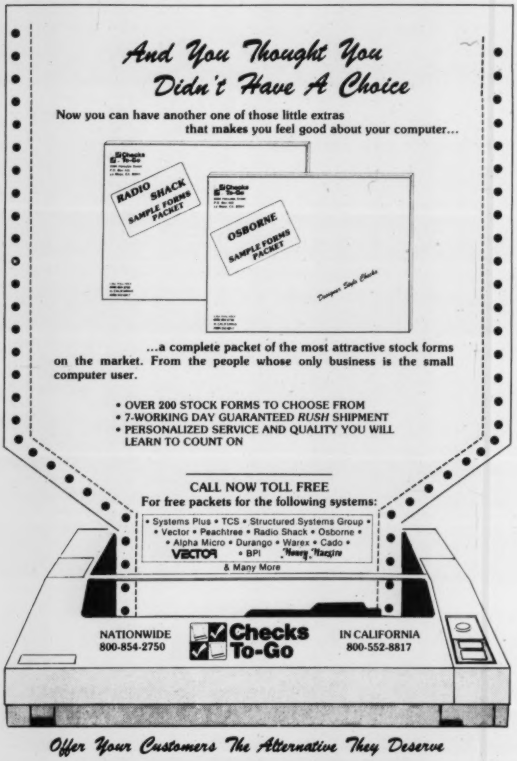

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Book Reviews, continued...

Seven appendices include a glossary, codes, electrical components (for the kit-builder), interface standards, magnetic-recording techniques, TV-signal standards, and standard flowchart symbols.

The first chapter provides dozens of uses for a computer, from games to music, and looks at the basics of hardware and software, which are amplified by the second chapter, in great detail and with many photographs.

The Basic chapter provides a fine explanation of the language and gives three program examples: arithmetic quiz, inventory control, and Monopoly.

The chapter on writing programs can be recommended to those who have been writing them a while, because of the excellent material about flowcharts, top-down design, and especially the long and valuable section on debugging, which includes dozens of suggestions on where to look for errors.

The remaining chapters are equally detailed, especially the last one, which goes into areas that few, if any, other authors have covered, including Buying For Your Background, and Planning For The Long Term.

This is one of Wiley's best, and is a great improvement over the original manuscript I was privileged to review for the publisher last year.

Programming in Basic for Personal Computers, by David L. Heiserman. Prentice-Hall Inc., New Jersey. 344 pages, hardcover $17.95, paperback $7.95. 1981.

The first four chapters present one of the slowest and most careful introductions to the basics of Basic available, with 96 pages devoted to PRINT, LET, RUN, END, INPUT, GOTO, and looping with IF/THEN and FOR/TO/NEXT.

Example after example is given, and discussed at great length. If you can't get past Chapter 1, forget it, you'll never learn to program.

The remaining ten chapters get into formatting hints, programming shortcuts, ON/GOTO, RND, GOSUB/RETURN, subroutines, functions, logic operators, strings, READ/DATA, and arrays.

Even when discussing multidimensional arrays in the last chapter, the author explains everything in such detail that this is an ideal text for learning Basic by yourself.

Microsoft Basic is the "brand of Basic used throughout this book," as the author puts it, and follows that with a curious statement, "Radio Shack's TRS-80 uses Microsoft Basic, so that will be the convention established in this book."

Each chapter ends with exercises; answers to selected ones are at the back of the book. Many of the early exercises ask the reader to "describe how the computer will respond to the following statements" or "describe what the following program will do," excellent progress checks.

Meant to be used hands-on with a personal computer, this is the book Radio Shack should have provided with the Level II TRS-80, instead of that all-too-brief reference manual.

Owning Your Home Computer, by Robert L. Perry. Everest House, New York. 224 pages, paperback $10.95. 1980.

Owning Your Home Computer is one of the most helpful, complete and well-written books available, not only as a guide for selecting a home computer, but for understanding companion areas such as networking, videotext, and help for the handicapped.

Fifteen chapters cover The Home Information Explosion (mainly videotext), home computers, The First Generation (early machines), How to Buy a Home Computer, recent computers, The Handiest Home Computers (TRS-80, PET, Apple, OSI, Compucolor, Sorcerer, Atari, etc.), networks, The Mind Appliance, Ninety-Nine Common Things to Do with a Home Computer, educational uses, Home Computers in Your Work, programming, Help for the Handicapped, home control, and The Thinking Computer of the Future.

As for those 99 Common Things, they include: play games, hold game tournaments, create stories, compose and play music, learn computer languages, learn advanced math, manage family diets, analyze private portfolios, do word processing/text editing, and many more.

Perry has obviously taken a great deal of time to make this a fine book with a wide coverage of home computers and adjacent areas. The book uses many pictures, chosen for illustrative purposes and not just to pad out the book. The descriptions of the Handiest Home Computers include lengthy paragraphs on system description, memory, peripherals, disk drives, printers, software, and system prices.

The appendix lists 1,050 home computer programs, by supplier and by category. A 4 1/2-page glossary is followed by a page listing 20 helpful books and six magazines.

Although there are a couple of pages on computers that haven't become popular, or which dropped quickly out of sight, such as the Texas Instruments 99/4 and the Bally Arcade, this happens with every such book, which begins to be out of date as soon as the writer finishes.

So You Are Thinking About a Small Business Computer, by the staff of *Computing in Your Business*. Canning Publications Inc., 925 Anza Ave., Vista, CA 92083. 104 pages, paperback $12.50. 1980.

This book is "especially suitable," according to the letter accompanying it, for "(1) small business owners and managers with limited or no previous experience who are in the process of selecting their first computer; and (2) computer professionals whose friends are asking them for help in selecting a small computer."

Although the book has only 96 pages of text, it is large, 8 1/2" by 11" in size, and it's from the company that has been publishing since 1963 the well-known and authoritative *EDP Analyzer* from which many pointed examples have been taken and placed amid the wealth of advice and common sense presented here.

The ten chapters cover How a Computer Can Help You, How Computers Work, Hardware, Software, Vendors, The First Step—Familiarization, Selecting a Complete System, If Custom Programming is Needed, Using a Consultant, and What the Future Holds.

The first appendix provides six pages of computer terms; the second, Some Leading Suppliers: major manufacturers (Burroughs, Honeywell, IBM, NCR, Sperry Univac), mini manufactuers (AM Jacquard, Basic Four, Data General, DEC, Hewlett-Packard, Microdata, TI, Wang), micro manufacturers (Apple, Cromemco, North Star, Ohio Scientific, Radio Shack, Vector Graphics), turnkey system suppliers (Cado Systems, Qantel), remote computing services (ADP, Boeing, GE, etc.).

This may well be the most practical of such guides, with much guidance in areas such as what can be expected (in customer support, marketing, peripherals, etc.) from manufacturers in the three groups, where to find software packages, vendor characteristics, "what NOT to do" if customer programming is needed, precautions regarding consultants, etc. The photos are few but good; the book is thin but crammed with help. ☐

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An Unusual Computer Kit

David Mannering

Diagrams by John Sankey.

Like a lot of eager but impoverished computer devotees, I was looking for an inexpensive way to obtain my own home computer. I had scoured the ads in the back pages of the computer magazines where they advertise slightly used vacuum tube computers for $19.95 plus postage, but I never found anything that was within my means that I felt I could use without a Ph.D. in physics or a private transmission line to the Grand Coulee hydroelectric plant. Things looked pretty bleak until I placed an ad in the local paper. The next day a small man dressed in a dark suit showed up at my door. I was immediately impressed by his lively eyes. (They were lively mainly in the horizontal plane.) He said that he had an inexpensive home computer kit and proceeded to give me a sales pitch. I don't remember much about his presentation since his voice was so soothing and rhythmical, and because he mentioned the price right up front. Now, I'm prevented by an oath of secrecy from revealing the exact price of the kit, but suffice it to say that between my wallet and some loose change I was able to come up with the cash on the spot. The man left with some mumbling about the warranty being voided if the box was opened, and I became the proud owner of a home computer kit. Now that my computer is up and running I think it is the best little computer in the world, and I want to tell you all about it.

> ***Some of the modules had several extra sockets which, I assume, implies future expandability.***

First, I must confess that I bought the computer in kit form with some misgivings. The last thing I attempted to assemble from a kit was a model car when I was in the fourth grade. I got as far as sticking the pin into the tube of glue before I got completely lost in the instructions. But this kit is different. No gluing (or even soldering) is necessary, and all of the components are color coded for easy identification. In fact, the outside of the box has a picture of a young child assembling the kit. The box, I might add, is cylindrical, but there is a reason for that which I will explain later.

The instruction manual is colorful but a little sketchy. In order to save money the instructions for several different kits have been combined into the same manual. So, in the same pages as the computer I also found diagrams for the construction of an airplane, a boat, and a firetruck. This was not a problem, however, as the diagrams were clearly labelled.

The kit components are modular, and all I had to do was plug them together to resemble the diagrams. Some of the modules had several extra sockets which, I assume, implies future expandability.

The first thing that I assembled was the power supply. It was a good place to start since it was very simple to construct. Like all power supplies, this one operates best in a cool environment. The manual

---

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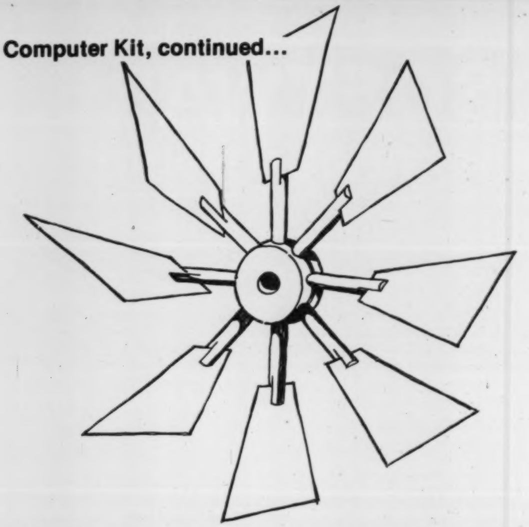

Diagram 1: Power supply. Heavy duty model can power operations involving numbers of up to 4 binary digits.

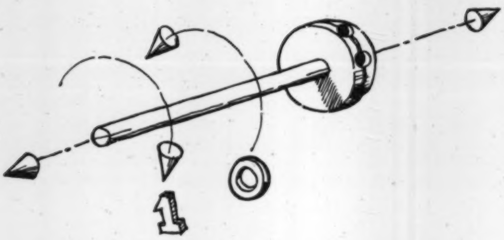

Diagram 2: Data bus. Data transmission takes place at 2 baud or 120 r.p.m.

recommends a drafty place, like next to an open window.

Next on the assembly instructions was the bus unit. The bus on this computer is of a revolutionary design. It consists of a single data line which transmits bidirectionally (clockwise=0, counterclockwise=1). Addressing is done by a lateral movement of the bus shaft to engage the proper memory location. No control lines are needed since the computer assumes that every third machine instruction is a memory fetch and dumps the data on the bus automatically.

The next part of the main computer to be assembled was the memory unit. This memory is of the destructive readout type, and it dumps its bits when accessed. It has a very nice additional feature in a hardware stack. Due to a unique data compression feature, only 1's may be pushed on the stack.

The processor was the most complicated part of the assembly, requiring frequent use of the only tool included in the kit, a large rubber band. Even using this tool to fasten together two modules while inserting a third, it was difficult to manipulate the components into the right positions. It almost seemed as if the kit were designed for smaller hands than mine.

The clock was fairly simple to install. It has a feature found on few other small computers. You can adjust the frequency of the clock by changing oscillator bars. For normal operations one uses the small bar, giving a fast clock. The larger bar is useful for debugging since you can grasp it for a manual single step of the computer.

With the main frame of the computer assembled and passing all tests (actually, the only test mentioned in the manual was whether or not the computer would stay in one piece when the rubber band was removed), I began the assembly of the peripherals. The input unit was the easiest. Unlike conventional keyboards no provisions for debouncing were required. However, a ratchet buffer was installed to prevent possible injury to the

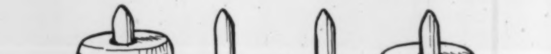

Diagram 3: Memory before and after destructive readout.

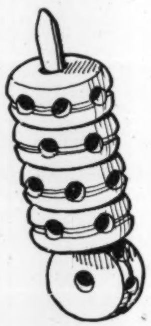

Diagram 4: Hardware stack. The stack overflows at six levels although if the machine is level it is sometimes possible to go higher.

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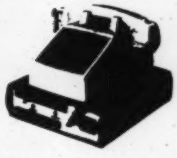

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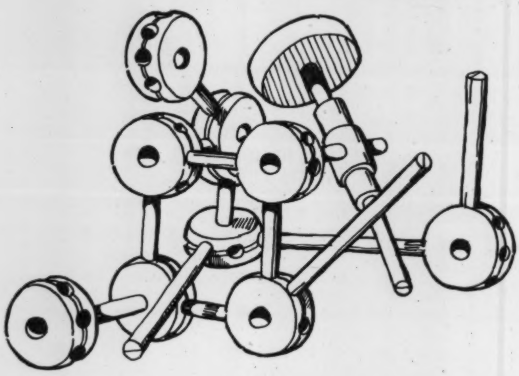


Diagram 5: Processor. Advanced features include 1 bit hardware multiply and divide.

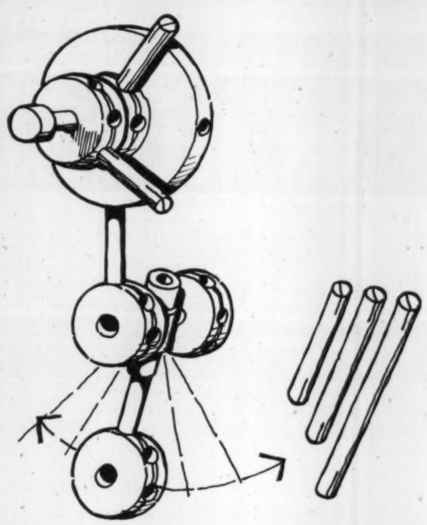


Diagram 6: Clock with extra oscillator bars. The clock does not generate an interrupt to the processor, but it can generate one for the operator via a configurable alarm.

operator in case the input port was ever used for output.

The display module was a little more complicated. Using the rare "bar matrix" technique it becomes possible to display most of the more commonly used ASCII characters without ambiguity.

Finally I came to the mass storage device. This is one of the most clever features of the kit design. Remember earlier I said that the kit's box was cylindrical. This is because it doubles as drum storage for the computer. This mass storage device is truly random access. When you access the drum it is truly random as to what bit you'll get.

My total time for assembling the computer was only two hours, and part of that was spent looking under the sofa for some parts that had rolled away. Although no software was included with the kit, it did not take me long to implement a drum operating system (DROPSY), a Basic interpreter, and a music system. (The computer does not have a built in speaker, but it can be interfaced to a bass drum via an inexpensive pneumatic attachment.) The programming of this software was made easier by the unique instruction set of the computer. Besides the normal data manipulation instructions it has the following special instructions:

> ***When I returned my computer was gone and in its place was a firetruck.***

CNTF...Centrifuge Accumulator: This causes all 1's to congregate in the highest bit positions.

MLM...Manual Load Memory: Operator assisted load after destructive readout.

CLUTCH: Disengages the clock from the processor before each bit shift.

The only negative thing that I can say about the novel design of this computer is that it requires a little more security than the average home computer. Once, after showing it to my pre-school aged niece I carelessly left the room for a short time. When I returned my computer was gone and in its place was a firetruck. It only took me an hour and a half to assemble the kit the second time. □

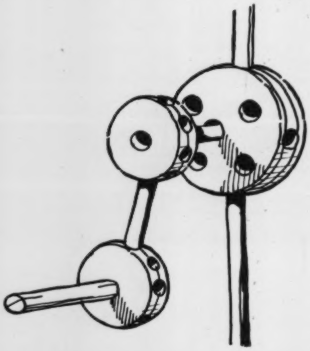
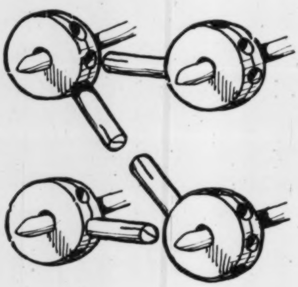


Diagram 7: Input device. This is designed for those operators not proficient in typing or keypad data entry.

Diagram 8: Output device: 2 x 2 bar matrix display of a '5' or else an 'S'.



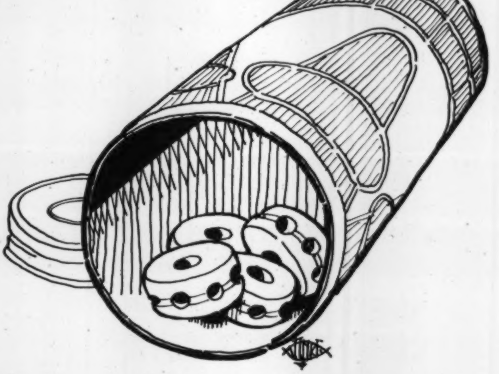


Diagram 9: Drum storage. On the left is the write-protect attachment which has the added feature of read-protecting the drum when in place.

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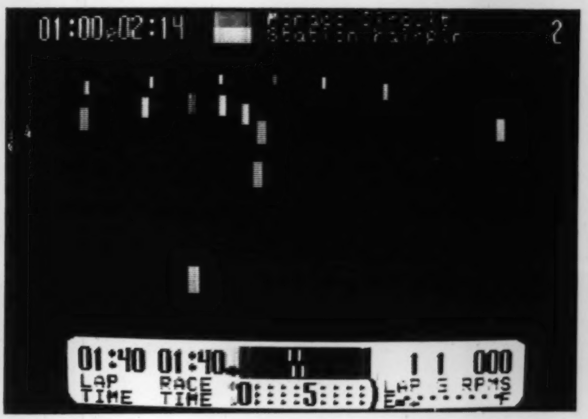

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CIRCLE 303 ON READER SERVICE CARD

Should you buy a home computer or a video game?

Buy Now, Play Later

As home video games become more sophisticated and home computers become less expensive, the problem of which to buy becomes more complicated. Many people know they want to participate in the joys of electronic entertainment, but aren't sure what type of product, let alone which brand, will provide the most satisfaction. If you are perplexed about purchasing, the following discussion should help.

At one point the choice was simple; you could buy a home version of Pong and play video games or get one of several computer kits on the market and type in games from the few sources available during the early days of home computing. But times have changed. Pong spawned a series of exotic home entertainment devices, and the early computers grew into today's wonder machines with fancy graphics, plenty of ready-to-run games, and simple operation. Still, there is a gap between the top of the line video games and bottom of the line computers. There are three main considerations: the versatility of the device, the availability of products, and the quality of the device. Let's look at these factors in order.

Versatility deals with how much you can do with the machine. Obviously, most computers are more versatile than most home video arcades. But there is no reason to pay for capabilities you don't require. If you just want to play Invaders, and don't have any need for word processing, it would be wasteful to buy a $2000 computer system when you could get a video game for less than one tenth the cost.

On the other hand, if you think you might want to do more than just play games, the video game won't offer the versatility you need. But be warned: though most computers are versatile, there is usually an added price above the purchase cost. For instance, to do word processing, you need a printer. To perform complex data storage functions, such as stock market analysis, you'll probably need a disk drive. In other words, some capabilities can't be realized without additional expense. Still, as long as you are aware of future costs and present limitations, there is nothing wrong with this. Versatility also takes a part in deciding between specific machines. A video game that comes with just a set of paddles permanently wired to the unit can't offer the same versatility as a game that accepts both plug-in paddles and joysticks. And a computer with no interface for a disk drive is obviously more limited than one designed with expansion in mind.

So, you can do more with a computer, but you often have to pay for extra capabilities. One question to ask is "Do I want these extra capabilities, or am I mostly interested in playing games?" Look to the future. Are there tasks you don't need performed now, but might want at a later date? Do you think the computer or video game will interest you for a long period of time? If there is a chance you'll become bored with your purchase in a few months, it's a lot less painful to let dust settle on an inexpensive video game.

Product availability is the second major factor. This refers to the number of accesories, games, or programs that will work with a unit. Some people have had the unfortunate experience of purchasing a video game, only to find that after the first year no new cartridges were forthcoming. Some of the least expensive home video games come with a limited internal set of games and no provision for adding new games. You should only consider one of these if you are totally addicted to the games it offers. The units that accept game cartridges have the potential to allow an unlimited number of games. But somebody has to manufacture them. If only a few cartridges are available, and the company shows no signs of introducing new ones, the unit will be rather limited.

The same holds true for computers. The most popular makes are backed by a large assortment of software from a multitude of vendors. The less popular brands sometimes offer an even smaller selection than certain video game units. With a computer, you stand a better chance of finding a wide selection of games since software on tape and disk is easier to produce than cartridges. But the expense of producing cartridges helps insure that more time will be spent developing a good product.

Obviously, your interests affect all this. If you want to play mostly arcade type games, the home units can give you what you want. If you are interested in other types of games, such as simulations, war games, or strategy games, a home computer will be more satisfying.

Quality, like versatility, determines the limitations of a machine. A video game designed with good screen resolution can present better games than one limited to working with large blocks. A computer that only offers low-resolution graphics won't be able to duplicate the games found in the better video game units. A video game that accepts slip-in cartridges can be preferable to a computer that has a poorly designed cassette interface.

The above has actually been concerned more with pointing out considerations than

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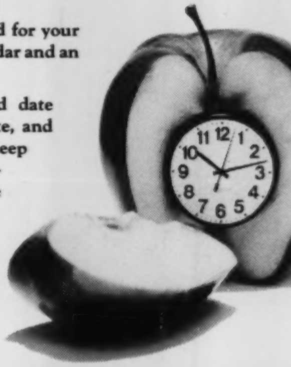

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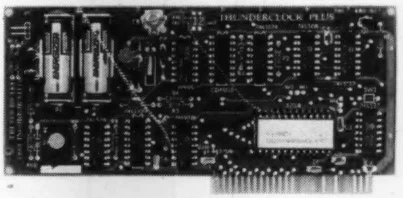

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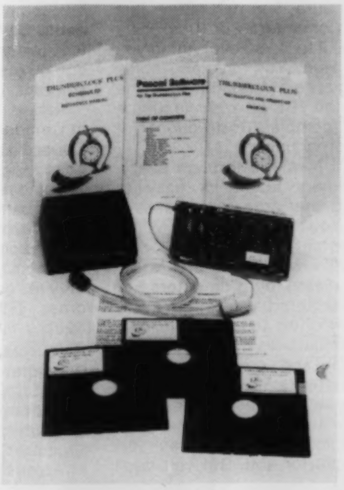

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CIRCLE 276 ON READER SERVICE CARD

Special editions for Apple, Atari and TRS-80 Computers.

Programming is Child's Play

Hey kids, are the folks out of the room? Good, 'cause I've got a secret to tell you. You know that computer they fuss over? Well, kid, between you and me, this whole programming thing is a lot simpler than they realize.

What's that? Sure, you can learn. Just get a copy of **Computers For Kids.** It's a super book, and it tells you everything you need to know. Huh? You have an Apple? No problem. There's a version just for the Apple. One for the TRS-80 and one for the Atari too, with complete instructions for operating and programming.

The book will take you through everything programmers learn. Its easy to understand and the large type makes it easy to read. You'll find out how to put together a flowchart, and how to get your computer to do what you want it to do. There's a lot to learn, but **Computers For Kids** has 12 chapters full of information. You'll even learn how to write your own games and draw pictures that move.

Just so the folks and your teachers won't feel left out, there's a special section for them. It gives detailed lesson ideas and tells them how to fix a lot of the small problems that might pop up. Hey, this book is just right for you. But you don't have to take my word on that. Just listen to what these top educators have to say about it:

Donald T. Piele, Professor of Mathematics at the University of Wisconsin-Parkside says, "**Computers For Kids** is the best material available for introducing students to their new computer. It is a perfect tool for teachers who are learning about computers and programming *with* their students. Highly recommended."

Robert Taylor, Director of the Program in Computing and Education at Teachers College, Columbia University states, "it's a good idea to have a book *for chidren*."

Not bad, huh? Okay, you can let the adults back in the room. Don't forget to tell them **Computers For Kids** by Sally Greenwood Larsen cost only $3.95. And tell them you might share it with them, if they're good. Specify edition on your order: TRS-80 (12H); Apple (12G); Atari (12J).

Your local computer shop should carry **Computers For Kids**. If they don't ask them to get it or order by mail. Send $3.95 payment plus $2.00 for one, $3.00 for two or more for shipping and handling to Creative Computing Press, P.O. Box 789-M, Morristown, NJ 07960.

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CIRCLE 350 ON READER SERVICE CARD

Computer or Game, continued...

providing solutions. In the end, the decision is up to you. If you enjoy games, but don't have the time or interest to work with a computer, the home video game might be ideal. And you can probably get several different video games for the cost of one computer. If you want to write programs, or need computer capability for something other than games, then a video game unit will provide more frustration than satisfaction. Even if you are only slightly interested in programming, you'll find that computers become more fascinating with each hour spent in their company. There are some people who believe the solution is to wait for prices to come down. While there will probably be some small price changes, and some new, inexpensive computers are bound to hit the market, those who wait rob themselves of time that could be spent enjoying their purchase.

Once again, before you make the decision, take some time to determine exactly what you require as far as versatility, product availability, and quality. It will be time well spent.

Listed below are the major video game units. Prices vary greatly from store to store, so shop around. ☐

Atari Video Computer System
Contains jacks for paddles, joysticks and numeric keypads. Over 60 cartridges are available from Atari and Activision. Priced in the $140-$200 range. From Atari, 1265 Borregas Ave., Sunnyvale, CA 94086.

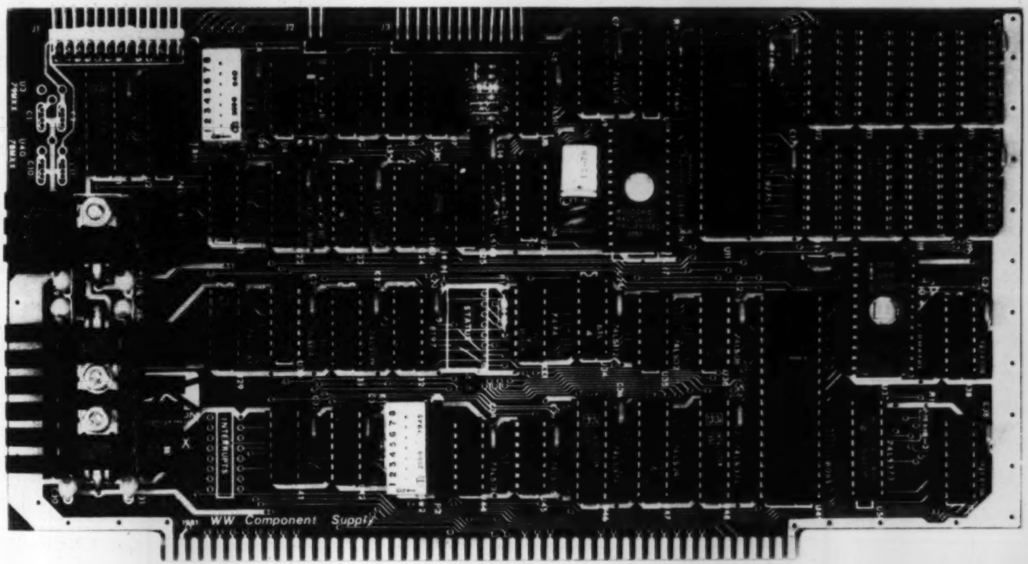
Intellivision
The unit features excellent hand controls with numeric keypad and object-movement disk. Over 25 cartridges available. Suggested list price is $300. From Mattel Electronics, 5150 Rosecrans Ave., Hawthorne, CA 90250.

APF MP 100 Video Game System
Controllers feature numeric keypad and joystick. There are eighteen cartridges available. Price range is in the $100 range. From APF Electronics, Inc., 1501 Broadway, New York, NY 10036.

Odyssey II
An offspring of the first entry in the field, the substantially improved Odyssey II features joysticks and a full keyboard. Thirty-two cartridges available. Priced around $200. From Magnavox Consumer Electronics Company, P.O. Box 6950, Knoxville, TN 37914.

Others
Radofin and Conic produce inexpensive units that are usually available under private labels. Cartridge selection is limited.

INTELLIGENT VIDEO I/O FOR S-100 BUS



VIO-X

The VIO-X Video I/O Interface for the S-100 bus provides features equal to most intelligent terminals both efficiently and economically. It allows the use of standard keyboards and CRT monitors in conjunction with existing hardware and software. It will operate with no additional overhead in S-100 systems regardless of processor or system speed.

Through the use of the Intel 8275 CRT controller with an onboard 8085 processor and 4k memory, the VIO-X interface operates independently of the host system and communicates via two ports, thus eliminating the need for host memory space. The screen display rate is effectively 80,000 baud.

The VIO-X1 provides an 80 character by 25 line format (24 lines plus status line) using a 5 × 7 character set in a 7 × 10 dot matrix to display the full upper and lower case ASCII alphanumeric 96 printable character set (including true descenders) with 32 special characters for escape and control characters. An optional 2732 character generator is available which allows an alternate 7 × 10 contiguous graphics character set.

The VIO-X2 also offers an 80 character by 25 line format but uses a 7 × 7 character set in a 9 × 10 dot matrix allowing high-resolution characters to be used. This model also includes expanded firmware for block mode editing and light pen location. Contiguous graphics characters are not supported.

Both models support a full set of control characters and escape sequences, including controls for video attributes, cursor location and positioning, cursor toggle, and scroll speed. An onboard Real Time Clock (RTC) is displayed in the status line and may be read or set from the host system. A checksum test is performed on power-up on the firmware EPROM.

Video attributes provided by the 8275 in the VIO-X include:

- FLASH CHARACTER
- INVERSE CHARACTER
- UNDERLINE CHARACTER or
- ALT. CHARACTER SET
- DIM CHARACTER

The above functions may be toggled together or separately.

The board may be addressed at any port pair in the IEEE 696 (S-100) host system. Status and data ports may be swapped if necessary. Inputs are provided for parallel keyboard and for light pen as well as an output for audio signalling. The interrupt structure is completely compatible with Digital Research's MP/M ®.

Additional features include:

- HIGH SPEED OPERATION
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- CUSTOM CHARACTER SET
- CONTROL CHARACTERS
- ESCAPE CHARACTER COMMANDS
- INTELLIGENT TERMINAL EMULATION
- TWO PAGE SCREEN MEMORY

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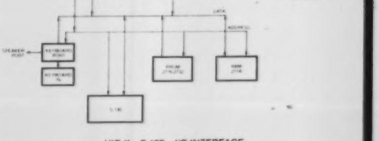
VIO-X2 - 80 × 25 7 × 7 A & T *Conversational & Block Modes*	**$345.00**



VIO-X S-100 I/O INTERFACE

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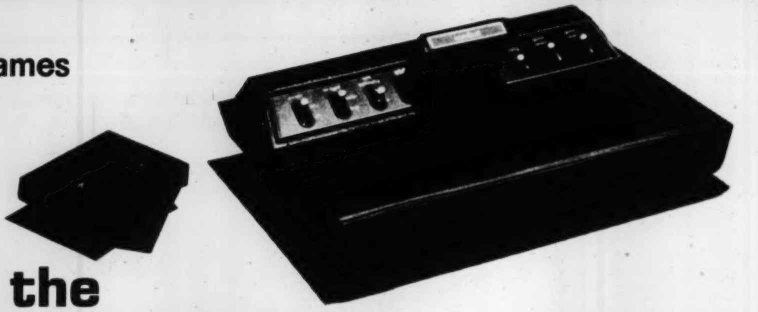
CIRCLE 315 ON READER SERVICE CARD

Our reviewer panel plays games



New Games for the Atari Video Computer System

David H. Ahl

Old Swedish philosopher* say: "a computer without software might as well be a boat anchor."

Since Atari is not anxious that their video computer systems end up as boat anchors they have introduced a steady stream of new software cartridges ever since the video computer was first introduced three years ago. Several Atari deserters, probably looking for big bucks, found some new blood and have formed a company, **Activision**, which also markets software cartridges for the Atari Video Computer System.

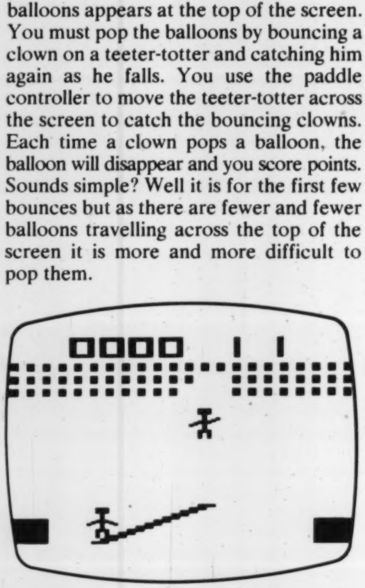
In this review we will take a look at some of the new cartridges that have been introduced during the last eighteen months and see how they stack up. These games have all been played by a somewhat eclectic cross-section of people so the reviews do not represent mine or any other single person's opinion of the games. Among others in the reviewing group are a ten-year old with unbelievable hand/eye coordination, a crossword/jigsaw puzzle fanatic, a computer game designer from the "old school," a dominoes fanatic, and a teenager (need we say more?). As I said, an eclectic group.

First catastrophe: the Atari Video Computer System itself blew out. Cause: static electricity. Even the *Wall Street Journal* carried an article about the problem of shuffling across one's living room floor, generating 30 or 40 thousand volts of static electricity and touching the Atari System. I guess we weren't alone.

Upon sending the unit back to customer service, Atari was very prompt about repairing our system and returning it. Nevertheless, it would have been much simpler had I remembered to "ground myself out" before touching any of the switches on the system. This is fairly easily done by touching some relatively large metallic object (a fireplace screen, panel on the TV set, heater vent, etc.) before touching the video computer system. Of course, if you have a decent humidifier in your house this is less of a problem. I didn't.

Circus Atari

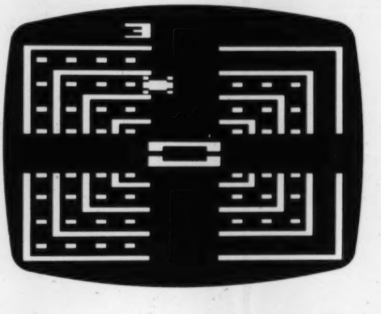
Pop! Pop! Pop the balloons and score points. A wall of red, blue and white balloons appears at the top of the screen. You must pop the balloons by bouncing a clown on a teeter-totter and catching him again as he falls. You use the paddle controller to move the teeter-totter across the screen to catch the bouncing clowns. Each time a clown pops a balloon, the balloon will disappear and you score points. Sounds simple? Well it is for the first few bounces but as there are fewer and fewer balloons travelling across the top of the screen it is more and more difficult to pop them.



There are eight variations to the game. In some, the clown bounces back after popping one balloon, in others the clown passes all the way through three rows of balloons. Most variations can be played by one or two players although each player competes individually and the final score determines the winner. If you liked *Breakout* you'll love *Circus Atari*. *Circus Atari* was one game that was enjoyed by every member of our panel of reviewers.

Dodge' Em

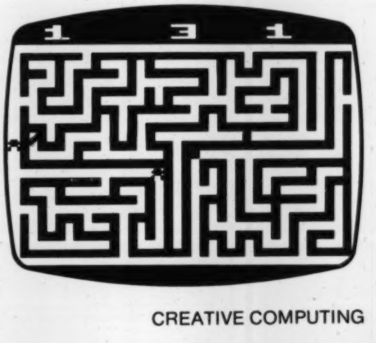
This was another game that ranked high with most of our players. In the game there are four concentric race tracks. Your race car automatically moves forward around the four-lane track. To steer the car right or left you move the joystick right or left. Ditto for up and down. The objective is to score as many points as possible by running over the dots which appear on the lanes of the track. The problem is that there is a computer car which races clock-wise on the track and tries to crash into your car. When a crash occurs, you lose a car. During your turn you get three cars. To avoid the computer car and still score points timing is vital. You must use the accelerator button to speed up or slow down and your skill at steering from one lane to another to win. Champion in this game was our ten-year-old tester.



Maze Craze

Another high ranking game with the group, *Maze Craze* is a one- or two-player game which requires the player to move his policeman from a starting position on the left of the screen through a maze of city blocks to an exit on the right. The joystick is used to move the cop forward, backward, left or right.

In the simplest game variations you can see the entire maze and your object is to get from the start to the finish in the



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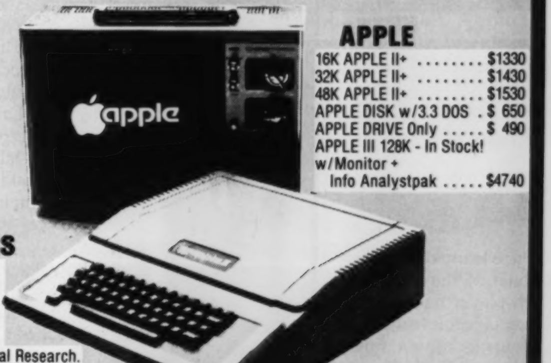

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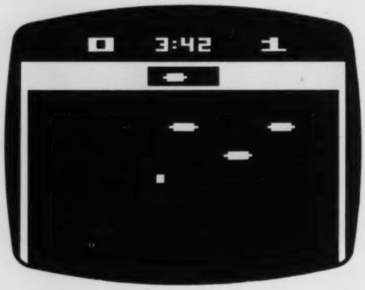
shortest time possible. More complex variations introduce armed robbers, blockades, wounds (from which it takes time to recover) and "terror" in which your cop cannot exit the maze until your opponent is knocked out by robbers. Diabolical!

Probably the most frustrating variations are those in which only a portion of the maze is visible. For very brief periods the entire maze flashes on the screen but during most of the play it is invisible. In other cases you have scouts which go ahead of you and try to find paths through the invisible maze. Unfortunately, the scout merely explores at random and seems to encounter more dead ends than useful paths. Nevertheless, almost everyone had a favorite variation among the sixteen that are available in this game.

Championship Soccer

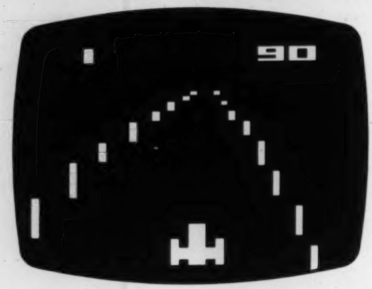
There is no way a review can do justice to a game which requires a 16-page rule book. One of the most complex new games introduced by Atari, it has no less than 54 variations. There are two-player and single-player variations. Ones in which the teams move at slow, medium or fast speeds. Ones in which penalties are ignored or included. There are three sizes of goals and three levels of difficulty.



Once learned, the game is a tremendous amount of fun and surprisingly realistic. Each player has a team of three players whose object is to kick and pass the soccer ball up or down the screen into his opponent's goal. There are two halves and the game is played in "real-time." A referee and linesman stand at the left side of the screen and determine penalties. A skillful player must learn both offense and defense. Perhaps most important is ball control which consists of the dribble, regular kick, and the fast and powerful toe-kick. Naturally, offensive moves may be blocked by a suitable defense. This game can be as simple or as complex as you wish. Under any circumstances it will probably hold your interest for a long time.

Night Driver

You're in the driver's seat and the track is just ahead of you on the screen. Your car is permanently fixed at the bottom of the screen and you must accelerate and steer the car through one of four tracks. Each time you veer off the track and hit one of the pylons or an oncoming car a simulated crash scene will appear.



This, of course, is the home version of the popular coin-op game. Some people love it and others hate it. There are three different tracks, novice, pro, and expert and variations which are timed (90 seconds) and not timed.

Freeway (Activision)

In addition to being one of the most unusual video games encountered, Freeway has another distinguishing characteristic. It's funny. In the game, the player has a bird's eye view of ten lanes of freeway traffic, five moving from left to right and five from right to left. The object of the game is to score as many points as possible by guiding a chicken across the ten lanes of traffic as many times as possible in 2 minutes and 16 seconds. The player has a choice of eight different freeways ranging from Lake Shore Drive in Chicago at 3:00 a.m. with thin automobile traffic to the LBJ freeway in Dallas at 5:00 p.m. with both automobile and truck traffic travelling at randomly changing speeds.

It's easy to get the hang of the game: the joystick simply moves the chicken forward or back. Each freeway can be crossed at two difficulty levels. In the novice level if your chicken gets hit by a car she is knocked back one lane, whereas with the switch in the A position, your chicken will return to the curb (the beginning) after being struck by a vehicle. Each of the freeways can be crossed by one or two chickens. To succeed in getting your chicken across, you must become familiar with the different traffic patterns in order to anticipate and make the right moves. This is especially difficult in freeways 5-8 where traffic speeds change randomly.

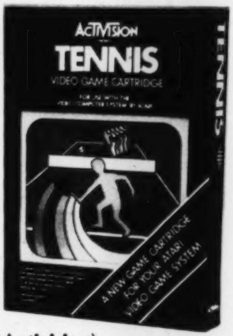
The motion is accompanied by sounds associated with a typical freeway: the drone of automobile and truck engines, the honks from horns of the vehicles and of course, the squawking of the chicken when she gets hit. It's hard to capture the sense of funniness of the game in words, but all of our reviewers agreed that this was one game that "made me laugh."

Kaboom!(Activision)

Kaboom! is another funny game. In it, a mad bomber is at the top of the screen moving back and forth at the top of a wall. Every once in a while, he drops a bomb with a lit fuse. At the bottom of the screen you have a bucket of water (controlled by a paddle controller) which you must move under the bomb to catch it. So far so good. Except that the mad bomber doesn't just drop one bomb at a time. He drops them in groups of 10, 20, 30 and up to 150. Not only that, but as the number of bombs increase, so does their speed. To compensate, the bombs in the larger, faster groups are worth more points when they are caught.

Sooner or later it happens: you miss a bomb. When you do, all of the bombs on the screen explode, you lose a bucket and the "mad bomber" expresses his happiness with a big smile. At this point the skill level drops back to the previous level and the game continues. You have three buckets to start and, for each 1000 points you score, you are given a new bucket (if one or two are missing).

To do well at the game, we found that getting a feeling for bomb patterns and anticipating the descent was more effective than trying to aim and line up the bucket under each falling bomb. All in all, funny and addictive.



Tennis (Activision)

Not at all like the original Pong game, *Tennis* is played on a perspective court in which one player plays on the bottom of the screen and the other on the top. After each game the courts are reversed. Just as in real tennis, you can aim and place the ball depending upon how you hit it. The angle of your shot is controlled by where you hit the ball on your racket. Also, as in real tennis, when you are volleying at the net you will notice that your shots don't travel as far as they do when you hit them from the base line. Also, you will be able to hit your most sharply-angled shots while playing at the net.

Alan Miller, designer of this game says that it "puts a premium on anticipation, reflexes, and conditioning." He's right. I never did master it even after hours of play, but I sure had fun trying.

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Atari Cartridges, continued...

Fishing Derby (Activision)

In this one- or two-player game you use your joystick controller to drop the end of your fishing line down to the level you want to fish. Then by moving the joystick right or left you move the bait to touch the mouth of the fish you want to catch. After you have hooked a fish it will swim slowly up to the surface. However, if you want to reel it in fast you push the red button. But be careful: there's a shark swimming back and forth who gobbles up the fish after they're on the line. Not only that, but only one player can reel up quickly if both players have fish on their lines. The other fish will swim up slowly until the first fish has either been caught or eaten by the shark.

David Crane, designer of the game probably won't like our calling the graphics 'cute' but that's what they are. This game incidentally, was the favorite among our female reviewers of all ages.

Laser Blast (Activision)

Laser Blast is not only a game of skill but also of endurance. There's no time for taking breathers. You've got to keep your ship in motion and fire quickly.

This game is just the opposite of ABM or Missile Command, in which you are the ground target shooting at a ship. In this game you are the ship shooting at a ground target which is firing back at you. You use the joystick to pilot your spacecraft from side to side and up and down. The red button is used to fire the ship's laser blaster. The firing procedure is unusual compared to other games: by pressing the button you aim your blaster and line it up on a target. Releasing the button fires the laser. For those used to firing various weapons by pressing the button, this game takes a bit of adjustment.

ACTIVISION
LASER BLAST
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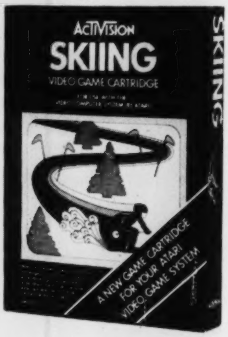
LASER BLAST

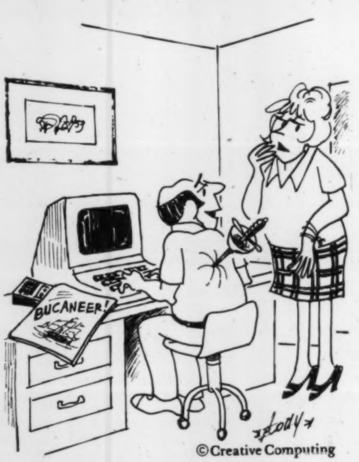
This is not an easy game. Activision has a note in their instructions that if you succeed in scoring 100,000 points or more and send them a picture of the TV screen you will be admitted to a special club. For each 1,000 points you gain you're given a reinforcement ship. I'm sorry to say, most members of our little testing group were rather frustrated and none of us could possibly imagine earning 100,000 points much less even the 1,000 points for a replacement ship (except for our 10-year-old super zapper). Nevertheless, everyone tried his best and had a good time attacking the "dreaded enemy forces."

Skiing (Activision)

In a sense this is a deluxe version of the slalom games in the Atari "Street Racer" game package. The game is played in much the same way: you come charging down the hill and aim your player from right to left with the joystick to go through the ski gates and avoid trees. Unlike *Street Racer*, you're playing on the entire width of the screen. Also the flags and trees are "more realistic." But the real difference is the fact that your skier has eight different ski positions and, by anticipating where the next gate will appear, you can aim your skier ahead of time to clear the gate and yet keep his skis pointed as straight down the hill as possible.



We found the only way to get really good scores was to memorize the run so you could anticipate what was coming next. There are five slalom runs and five down-hill runs. The down-hill runs have an extra little goody, a mogul, which must be jumped unless you wish to fall on your face and lose valuable time. No simple game this. No one ever did get to the point of putting their skill switch in the "A" (maximum skill) position.



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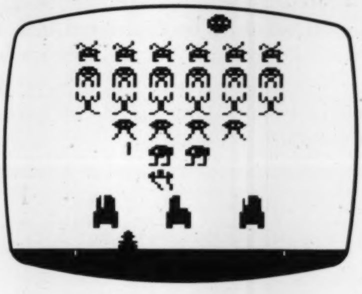
"Damn' realistic computer game!"

All Time Favorites

Although reviewed before on these pages, we'd like to draw special attention to several games to which our reviewers and guests keep coming back. These include **Space Invaders**, probably Atari's all time favorite game (rivaled only by **Asteroids**, which is due to hit the market some time this fall). Another favorite is **Sky Diver** in which the player releases his skydiver from an airplane and must land him on either a stationary or moving landing pad. We have found that this game has universal appeal to all ages and sexes.



Breakout also remains high in popularity. The Atari game has both "Breakout" and "Break Through" versions, however the old standard one ball hits one brick seems to be the lasting favorite. **Canyon Bomber**, particularly the untimed, unlimited bombs version also remains a favorite, perhaps because it requires very little skill, has lots of noise and action, and is lots of good clean fun whether or not one has superior eye/hand coordination. **Indy 500** also remains a favorite but, unfortunately, requires a different set of controllers from any of the other games.

Almost everybody has one or more favorites among the 50 variations of **Video Olympics**. Sure it's six years old, but Pong with "speed-up or whammy" still remains a favorite among many of our reviewer group. Others of the over 50 Atari and Activision games got votes as favorites from one or more of our reviewers. Our advice: if you don't want to spend the $1000 necessary to have every one of the Atari and Activision video games in your library, try as many as you can at a store or a friend's house, select the ones you like, buy them and have a ball. Any one of them beats the summer reruns on TV!

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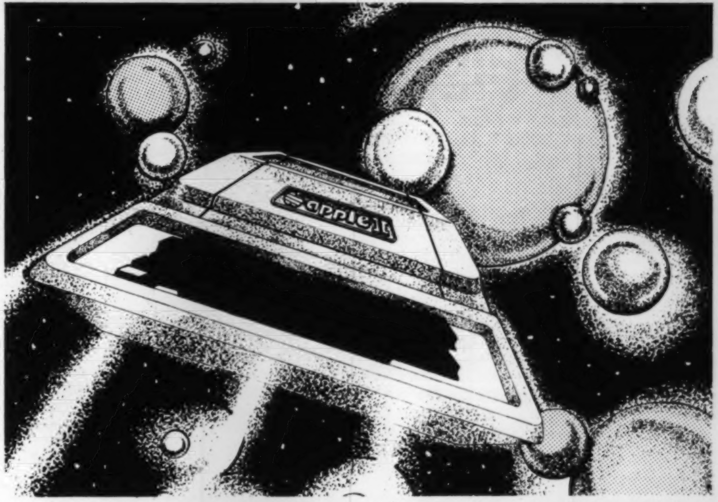

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Electronic Games Round-Up

Danny Goodman

It has been only four years since we were first captivated by red LED blips moving across Mattel's handheld football, basketball and auto race games. With our control buttons, we dodged our way across a field, down a court and around a track. All the time, some unknown, unseen opponent inside that gadget sent men and obstacles out to get us.

The following year, we were all doing as Milton Bradley's Simon did, trying to memorize longer and longer series of light and sound sequences.

To keep us interested year after year, game designers continue to find new electronic game applications with greater machine intelligence and better communication between computer and player.

This year we find some new kinds of electronic game activities. No fewer than four distinctly different handheld/tabletop bowling games are on the shelves. Reversi, better known by the trademarked Othello name, is available in board and handheld versions. Last year's popular arcade games like Galaxian can be found in handheld versions. Even a quickly implemented Pac-Man variant may join one of the hottest bandwagons to date. ROM programs are getting more sophisticated, most notably in the very advanced state of chess programs offered in board game size. Some action games sense response times of their players and speed up to keep good players from becoming bored, or slow down to give novice players the illusion they are gaining on the menacing computer.

Programmability, once the main attraction in the video game ring, is helping sophisticated under-$100 tabletop games have a longer and more varied life before they become old hat. For another $15-25 you have a whole new game that would have cost $75 or more by itself.

Probably the most exciting developments this year took place in the communications media—especially displays. Plain ol' LED blips are on the way out. To replace them are: 1) detailed multi-color vacuum fluorescent displays to help you tell the good guys from the bad guys on the screen; and 2) higher resolution liquid crystal displays than we've seen in the past. The LCD's are grasping for the flat-panel television display effect, as response times of new LC materials make moving images relatively crisp.

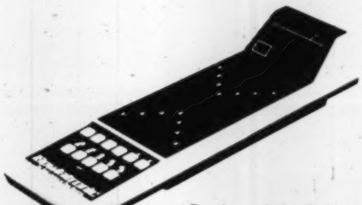
Speech snythesis, popularized by Texas Instruments' Speak & Spell, was expected to make a big splash this year. Not so. The speech chips and vocabulary encryption costs were still too high to give voice to a lot of games. Perhaps next year....

Our thirst for sophisticated games is keeping prices up, although not as high as comparable brain power would have cost a couple years ago. We are getting more for our money this year, but be prepared to spend at least $40 for a challenging handheld/tabletop game, and considerably more for professional quality electronic board games like chess.

Spotlighted below are some new electronic games from which to choose this season.

Sports Games

Electronic bowling is the rage this year, if all the new bowling gadgets are any indication. Of all the new ones, Coleco's Bowlatronic (under $60) offers the most interesting play, in spite of its red LED display. Up to four players can roll the LED ball. The player has a lot of control: speed of the ball approach, spot along the foul line at which the ball is released, and selection of four curves or straight ball. If you come across a tricky spare, there is a "hint" button to show you which path you can take to convert the spare—then it's up to you to do it at the correct speed. A three-digit numeric LED display keeps score for each player.



Bowlatronic by Coleco.

If the Coleco unit is too big for your travel bag, you can always pick up Tomy's Wrist Bowling (around $40). That's right, a bowling game for your wrist incorporated into an LCD digital watch display. A little LCD bowler, controlled by one of three faceplate buttons, releases the ball, aiming at 10 LCD pins for you. Converted spares and strikes earn you a series of rewarding beeps. The unit also functions as a watch, a stop watch and alarm. As a time piece, it is a bit bulky, but as a conversation piece, it can't be beat this year, even by the talking watch.

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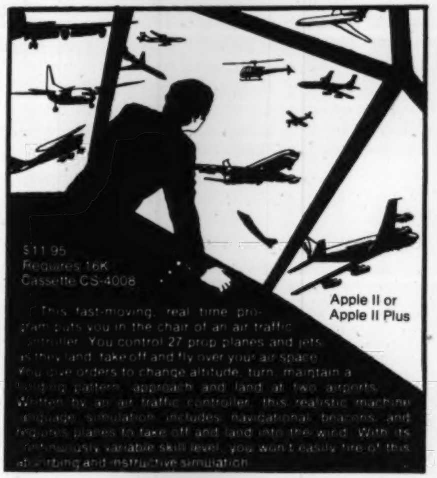

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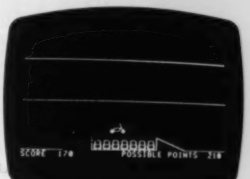
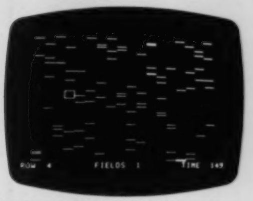
This fast-moving, real time program puts you in the chair of an air traffic controller. You control 27 prop planes and jets as they land, take off and fly over your air space. You give orders to change altitude, turn, maintain a holding pattern, approach and land at two airports. Written by an air traffic controller, this realistic machine language simulation includes navigational beacons, and requires planes to take off and land into the wind. With its continuously variable skill level, you won't easily tire of this absorbing and instructive simulation.

Action Games

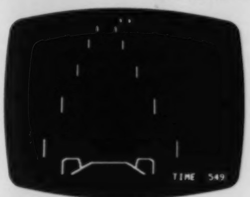
Cassette CS-4017 $11.95 3 Games Requires 16K Apple II or Apple II Plus



Cycle Jump. Try to jump over rows of cars, buses and trucks.



Mine Rover. Use your rover to cross a mine field with moving mines.

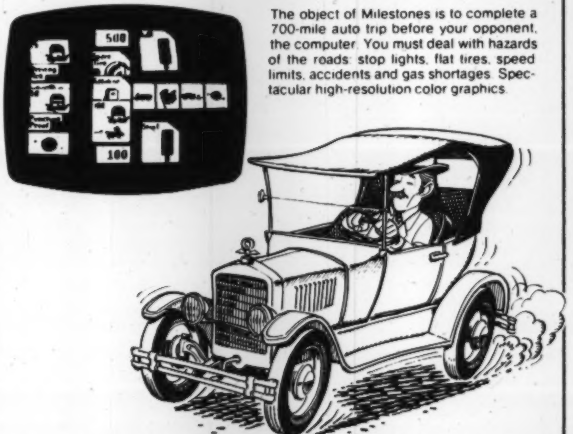


Road Machine. Drive over a curving, mountain road as fast as possible. Eight skill levels.

Milestones

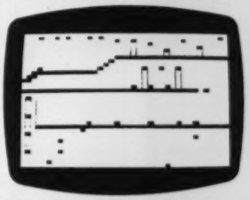
Cassette CS-4015 $11.95 Requires 48K Applesoft or Apple II Plus

The object of Milestones is to complete a 700-mile auto trip before your opponent, the computer. You must deal with hazards of the roads: stop lights, flat tires, speed limits, accidents and gas shortages. Spectacular high-resolution color graphics.

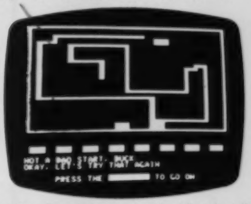


Bumping Games

Cassette CS-4020 $11.95 3 Programs Requires 16K Apple II or Apple II Plus

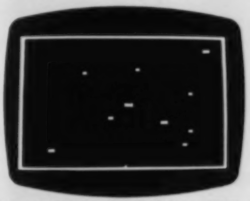


Obstacle Course. This multi-level course includes hurdles, ladders, tires and penalty areas. Different every time.



NOT A BAD START, BUCK
OKAY, LET'S TRY THAT AGAIN
PRESS THE TO GO ON

Hustle. The score keeps building but the escape routes dwindle. Can you reach the blocks before they disappear?



Bumper Blocks. An absorbing game of evasion and collision. Five skill levels.

Action & Bumping Games

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Milestones

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In addition to the game itself, this disk contains the complete playing instructions.

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CIRCLE 300 ON READER SERVICE CARD

Electronic Games, continued...

Old favorite action sports are back this year in some quite sophisticated games. Mattel, still offering their famous small handheld series, has added two World Championship games for football and baseball. The play on both games for one or two players is elaborate and represents an above average value even at about $55 each.

World Championship Football by Mattel.

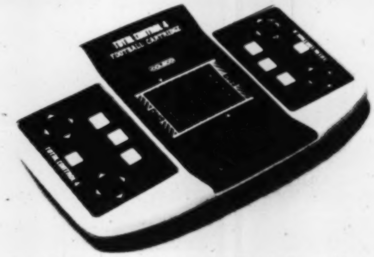
In Football, the offensive player controls the quarterback as usual, but also programs independent primary and secondary receivers. The defensive player controls the safety, programs the linebackers, and adjusts the entire five-man formation after the offense is set. There is even an automatic five-yard penalty for delay of game (30-second clock). The vacuum fluorescent display shows a different color for each team, and the men are depicted as figures, not blips.

World Championship Baseball is equally involved. Here, you can select your active line-up from a 15-man roster. Each player has a fixed history of statistics in the game's computer. Offense can lead off, defense can pick runners off base, pitchers tire out and need relieving.

World Championship Baseball by Mattel.

Both games are getting much closer to the feeling of real game strategy.

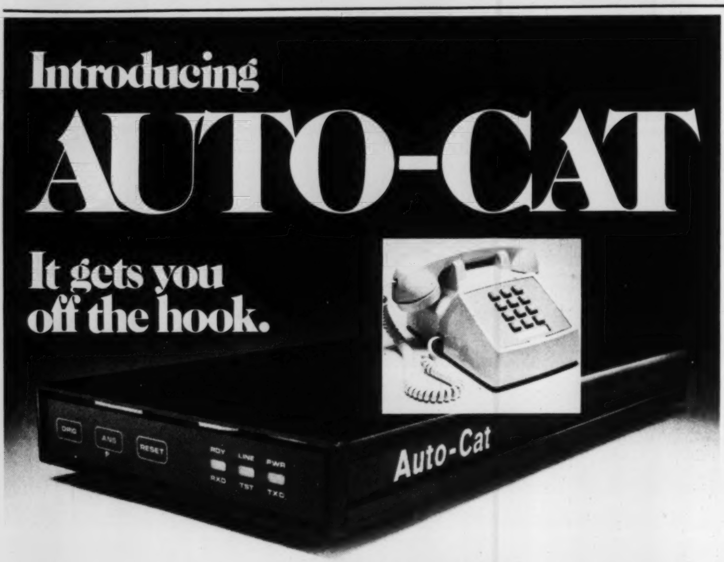
Coleco has a different approach with its Total Control 4 sports cartridge system (under $80). Football comes with the unit, and Hockey, Soccer and Basketball are also available at under $30 each. This system has two joysticks for each side so you can literally control two men during a play—two forwards on offense and the center plus one guard on defense in Basketball, for example. In control of two offensive players, you can better plan passes, even set up a pick in Basketball. Four joysticks also let four human players get involved, but one (vs. the computer) or two are more practical.



Total Control 4 by Coleco, with Football cartridge in place.

Interchangeable cartridges, which provide customized playfields and scoreboards, make this game a low-cost alternative to a programmable video game, and it doesn't tie up the family TV.

On the auto race track this season, the handheld Entex 3-D Gran Prix (about $50) employs a very detailed liquid crystal display designed to give you the illusion that you are behind the wheel of a race car. It's as if you're looking through the windshield. Your job is to speed up, brake, and steer your way around other cars. You have four lanes to change into, but at high speeds you sometimes find yourself zooming in on barriers in lanes 1 and 4.



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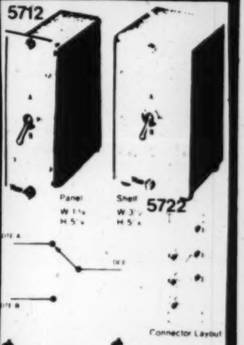

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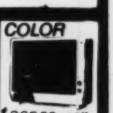

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CIRCLE 238 ON READER SERVICE CARD

Space and Arcade Games

In case you still haven't had enough of Space Invaders-type games, there are some new handheld versions to tempt you. The improvements this year are primarily in displays, trying the recreate the scene on the arcade game CRTs.

Alien Attack by Coleco.

Sonic Invader by Video Technology.

Sonic Invader (about $40) by Video Technology offers a straightforward game, with three columns of invaders to shoot at. Its three-color VF display is more interesting to watch than the other basic invader games around.

A variation on the Space Invaders theme can be found on Coleco's Alien Attack (under $60). In this game, aliens come after you from four sides. Fortunately, you can shoot in four directions and hide behind a series of permanent shields. But as the invaders come at you faster and faster, the play gets pretty hectic. This space game also has a two-color VF display for more interesting graphics.

Probably the most engaging new space game this year is Entex Galaxian 2 (about $55), a handheld version of the famous arcade game. The three-color display is one of the most finely detailed VF graphic presentations on any game to date. Just as in the arcade version, aliens break away from the formation and try to beam in on you. The white space cruiser styling of the game case is striking on its own.

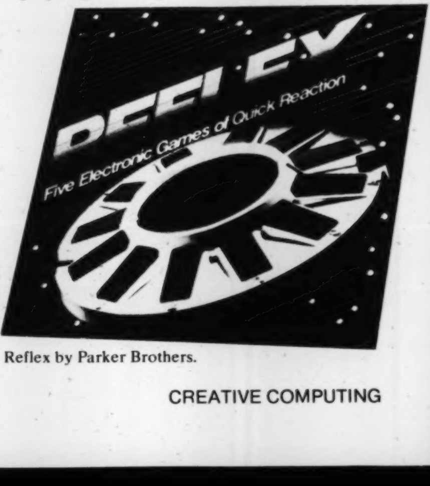
Closer to earth, but still up in the air, is Bandai's TC-7 Air Traffic Controller ($45). It tests your mettle by putting you in charge of an airport control tower. Your "radar" screen shows eight LED-illuminated glide paths around your airport, your job is to give it landing instructions along the glide path during its approach. You instruct the pilot on rate of descent and speed. An LED digital readout on the screen flashes air speed and altitude for the plane much like a modern radar transponder. At higher skill levels you have several planes arriving and taking off at one. And if a plane crashes, it's on your conscience.

Speaking of arcade games, be on the lookout for a rumored Pac-Man handheld game to come from Entex in time for Christmas.

Tabletop Action Games

Simon was the first successful game to use simple flashing lights and sound as the communications media between computer and player. No simulated playfield, no digital display. Yet those flashing lights evoked plenty of action from us. Some new light-based games along this line are inviting you to play.

Parker Brothers introduces the flying-saucer-shaped Reflex (about $30) for one or two players. Most of the games are good tests of hand-eye coordination. Twelve red lights are arranged in a circle around the hub of the game. Twelve pushbuttons that look like fat spokes coming out of the hub correspond to the location of each light. One of the two-player games represents a tetherball con-



Reflex by Parker Brothers.

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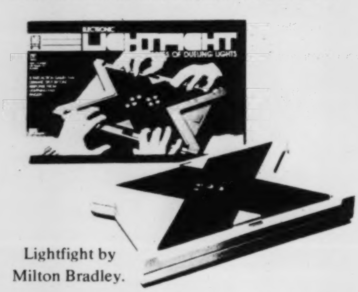
Electronic Games, continued...



Lightfight by Milton Bradley.

test, as each player tries to "hit" the light ball (the pushbutton must be hit precisely as the corresponding light flashes) around the pole faster and faster against the opponent.

The other interesting light-based coordination game is Milton Bradley's Lightfight ($40), a two-player game. Here, a diamond-shaped grid of 25 lights is the focus of attention as each player presses keys with both hands to intersect at the desired light.

The play action of these two games is surprisingly different, but Lightfight is more challenging in the dexterity department. One problem with both, however, is that the lights are difficult (if not impossible) to see in direct sunlight. Indoor play is the rule here.

Adventure Games

Adventure gamers have some electronic versions to look at this year, in case neither computer nor human opponent is handy.

Dungeons & Dragons by Mattel.

Mattel's Dungeons and Dragons ($50) was developed jointly with Gary Gygax, founder of the official Dungeons & Dragons role playing game—now a business unto itself as TSR Hobbies, Inc. In Mattel's game, the computer acts as Dungeon Master and establishes the mazes which are actually constructed for each game with plastic pieces on the castle-looking game board. One or two players can seek the treasure. But be mindful of the computer controlled dragon. If you're not careful, you will hear him munching on you.

Another popular kind of computer adventure games makes you find your way through a maze of walls, halls and doors. Entex has such a handheld game called 3-D Escape (around $50). A clever LCD display gives you the illusion you're walking through the maze just like the video displays on computer game software. With each step in any direction, the display instantly shows the next scene. The response time is much faster than personal computer maze programs. Within even this small unit are 1000 different mazes, so it's not likely you'll tire of this one soon.

Other Programmable Games

Milton Bradley's Omni, a rather expensive game system uses interchangeable cartridges to quiz players like a TV game show. Eight-track cartridges play questions through the Omni console and wait for the players to key in their answers through the 11-button keyboard at each player position. Digital data on one of the stereo tracks instructs the console how to score right answers. Cartridges contain about

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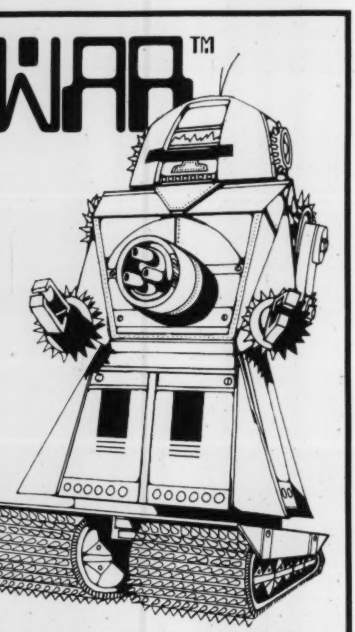

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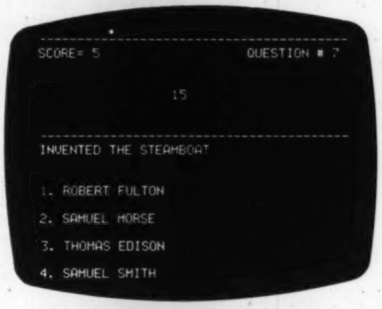
CIRCLE 225 ON READER SERVICE CARD

Atari sensational software

creative computing software

Trivia Unlimited

Cassette CS-7001 $11.95 Requires 24K

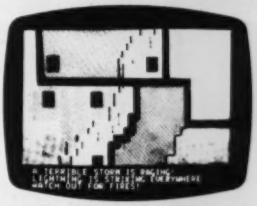


```
SCORE= 5                    QUESTION # 7

                 15

INVENTED THE STEAMBOAT

1. ROBERT FULTON

2. SAMUEL MORSE

3. THOMAS EDISON

4. SAMUEL SMITH
```

Test your expertise in any of seven areas: science, geography, history, computers, TV and movies, English language, or trivia. Speed and number of correct answers determine your score in this challenging series of multiple-choice quizzes. Over 200 questions in all.

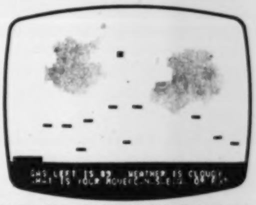
Outdoor Games

Cassette CS-7002 11.95 4 Programs Cassette CS-7002 (32K) $11.95



```
A TERRIBLE STORM IS RAGING!
LIGHTNING IS STRIKING EVERYWHERE
WATCH OUT FOR FIRES!
```

Forest Fire. Use chemical retardants and backfires to control raging forest fires.



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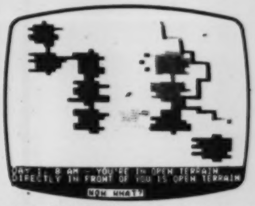
GAS LEFT IS 89   WEATHER IS CLOUDY
```

Fishing Trip. Try to catch flounder and salmon while avoiding logs, sharks, bad weather and running out of fuel.



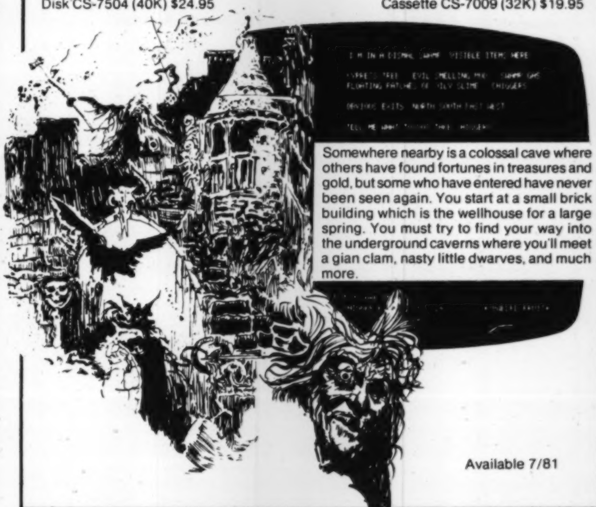
```
DAY 1, 8 AM - YOU'RE IN OPEN TERRAIN
DIRECTLY IN FRONT OF YOU IS OPEN TERRAIN
NOW WHAT?
```

Treasure Island I. Your map shows buried treasure but unfortunately you don't know where you are. Try to find the treasure while moving about and observing your surroundings. You have a 3-day supply of food and water. You may find useful objects (compass, weapons, a horse) but watch out for hazards (robot guards, pirates, caves, crocodiles, mountain lions and more).

Treasure Island II. Same game except you have to use a metal detector to find the treasure.

Original Adventure

Disk CS-7504 (40K) $24.95 Cassette CS-7009 (32K) $19.95



```
I'M IN A DISMAL SWAMP. VISIBLE ITEMS HERE:

CYPRESS TREE. EVIL SMELLING MUD. SWAMP GAS.
FLOATING PATCHES OF OILY SLIME. CHIGGERS.

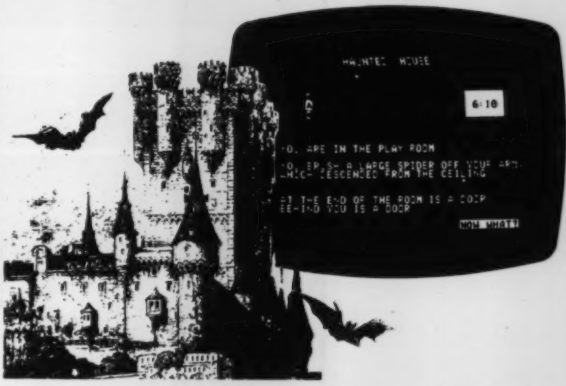
OBVIOUS EXITS: NORTH SOUTH EAST WEST
```

Somewhere nearby is a colossal cave where others have found fortunes in treasures and gold, but some who have entered have never been seen again. You start at a small brick building which is the wellhouse for a large spring. You must try to find your way into the underground caverns where you'll meet a gian clam, nasty little dwarves, and much more.

Available 7/81

Haunted House

Cassette CS-7003
$11.95
Requires 32K



```
HAUNTED HOUSE

                                   6:10

YOU ARE IN THE PLAY ROOM

YOU BRUSH A LARGE SPIDER OFF YOUR ARM,
WHICH DESCENDED FROM THE CEILING

AT THE END OF THE ROOM IS A DOOR
BEHIND YOU IS A DOOR
                                NOW WHAT?
```

It's 6:00 pm and you have until midnight to find the secret passageway out of a large rambling HAUNTED HOUSE. During your search you'll encounter skeleton keys, charms, friendly ghosts, and evil spirits. Sound effects add to the eerieness. The layout changes in every game.

Trivia Unlimited

Disk CS-7501 (16K) $19.95

This is a menu driven version of CS-7001.

Hail to the Chief

Disk CS-7701 (40K) $24.95
Cassette CS-7201 (32K) $24.95

This comprehensive election simulation is described completely in the Apple software section.

Outdoor Games & Haunted House

Disk CS-7502 (40K) $19.95

This disk contains all five programs from cassettes CS-7002 and CS-7003.

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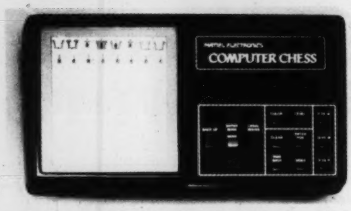
Electronic Games, continued...

200 questions in a specific category. Topics available at $8 each range from Jeopardy to Vincent Price's TV Trivia (with Price himself reading the questions) to three different sports quizzes hosted by Pat Summeral. A dozen cartridges are now available. But at about $120 for the Omni console and one cartridge, it may have appeal only to the upper crust.

Back to earth with a more reasonably priced and more action-oriented programmable, we have Entex Select-A-Game Machine (about $60) which has a two-color VF display and interchangeable overlays to help customize the playfield to the games contained in the plug-in cartridges. Space Invaders, Pinball, Football, Baseball, Basketball—and by Christmas maybe even Pac-Man—cartridges are $18 each.

Chess Games

Electronic chess battles are heating up quickly as several new brand names join updated programs offered by such bellwether makers as Fidelity and Applied Concepts. There seems to be intense competition for the "Number One" position among the various chess programs, plus a race in technology and styling to make the games easier to play and more attractive than utilitarian.



Computer Chess by Mattel.

A noticeable technological trend is the use of detailed LCD displays to portray the pieces on a chess board. This is especially helpful on portable and handheld units, where chess pieces are easily lost or damaged.

Mattel's Computer Chess ($110) with four levels of play is a good example. Four direction buttons let you maneuver the cursor to the piece you want to move, pick up the piece and position it in the appropriate square. The computer lets you take back up to three moves. You can also disengage the computer so two human players can compete against each other, using the LCD chess board and pieces. Technical consultant for Mattel's chess game was Julio Kaplan, former World Junior Chess Champion.

Another new name on the U.S. scene is Novag with some innovative products in their line.

For the serious chess player, a quartz chess clock ($145) keeps LCD digital time to the second. It can be plugged into a few of Novag's sensory chess games to automatically keep track of your time and the computer's.

Savant chess game by Novag.

Novag's Savant ($625) comes equipped with a 24K Mychess program and unique sensory LCD chess board. Unique because you move your pieces by touching them on the LCD display with your finger and touching the squares where they are to go. No keyboard entry to punch in or chess pieces to move. The Mychess program is a nine-level game that will also solve mate-in-seven problems.

And if you remember last year's Handroid chess computer, Novag's Robot

SELECTED ELECTRONIC CHESS GAMES

Manufacturer	Model	Price	Configuration	Computer/Human Interface	Program
Applied Concepts	Great Game Machine	$230	Tabletop: computer slides out from chess board cover	Keyboard grid position input; VF display	None. Requires cartridges for play.
Applied Concepts	Gruenfeld Opening Book	$100	Plug-in cartridge	Keyboard grid position input; VF display	8K opening book only.
Applied Concepts	Morphy	$115	Plug-in cartridge	Keyboard grid position input; VF display	8K complete game; strongest in middle game.
Applied Concepts	Capablanca End Game	$160	Plug-in cartridge	Keyboard grid position input; VF display	8K end game only.
Applied Concepts	Handroid	$1995	Tabletop board	Magnetic sensory board electromechanical robot arm	Boris 2.5
Fidelity	Champion Sensory Chess Challenger	$375	Tabletop board	Touch sensitive membrane board; speech verification	Improved 1980 Micro Chess Championships winner.
Fidelity	Voice Sensory Chess Challenger	$360	Tabletop board	Touch sensitive membrane board; speech verification	(Not available)
Fidelity	Sensory Chess Challenger	$155	Tabletop board	Touch sensitive membrane board	(Not available)
Fidelity	Voice Chess Challenger	$250	Tabletop board	Keyboard grid position input; speech verification	(Not available)
Fidelity	Mini Sensory	$ 60	Handheld board	Touch sensitive membrane board	(Not available)
Mattel	Computer Chess	$110	Handheld; LCD board & pieces	Keyboard positioning of cursor and pieces	Julio Kaplan
Novag	Micro Chess	$ 60	Handheld board	Touch sensitive membrane board	(Not available)
Novag	Savant	$625	Tabletop; LCD board & pieces	Touch sensititive LCD display	24K Mychess
Novag	Robot Adversary	$1300	Tabletop board	Magnetic sensory board; electromechanical robot arm	24K Mychess
SciSys	Chess Champion Mark V	$398	Tabletop; LCD board & pieces	Keyboard positioning of cursor and pieces	(Not available)
SciSys	Intelligent Chess	$499	Tabletop computer only	Keyboard grid position input; LED and TV board verification	(Not available)
SciSys	Executive Chess	$130	Handheld; LCD board & pieces	Keyboard positioning of cursor and pieces	(Not available)

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Cat No. 3156 Raster Blaster (Bill Budge)	**$29.95**

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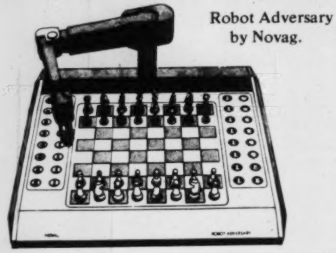
Electronic Games, continued...



Robot Adversary by Novag.

Adversary ($1300) will astonish you with its streamlined design and rich-looking game board. For many human players, the ability to pick up a real chess piece in a game is a very important element in the play. With this robot, all you do is move your piece as if you were playing your regular human chess partner. The computer does the rest by sensing your move and making its own countermove. After you get used to the novelty of watching the robot arm, the game is the least distracting electronic chess game format, because you don't have to bother moving your opponent's pieces or entering moves on a keyboard. The computer is almost transparent. Robot Adversary has the same 24K Mychess program as the Novag Savant.

Fidelity Electronics has been building chess games in Miami since 1977 and has won the titles at two Microcomputer Chess Championships in 1980. Since then they have reportedly improved their program and incorporated it into their Champion Sensory Chess Challenger ($375). This top-of-the-line unit has speech synthesis to help verify moves and a built-in library of 64 famous chess games for you to study and emulate.

Mini Sensory Chess Challenger by Fidelity.

A real chess value in Fidelity's new Mini Sensory Chess ($60). A sensory keyboard is part of this portable battery operated game. As with its bigger sensory brothers, you press down on the piece to let the computer know which piece you're about to move, then press the piece down on the new square to enter the move. In portable operation, it uses quite a few batteries (six AA cells), but the game is also programmable, with cartridges soon available for advanced chess, chess book openings, chess master games and other non-chess board games. A game with all these features at this price was unthinkable even a year ago.

Finally, we come to Applied Concepts, whose $230 Great Game Machine (newly facelifted version of the Modular Game System) offers a series of sophisticated game cartridges for the seasoned game player. One cartridge plays a Gruenfeld opening book game ($100), with 28 major openings and 490 variations. Once you've made your way through the opening game (it will detect a weak or unorthodox move and go out of opening book immediately) you can store any game in memory and insert the Morphy cartridge ($115), which is strongest in the middle game. From there you can switch to the Capablanca end game cartridge ($160). The three cartridges combined give you the equivalent of a 24K program. The mainframe also accepts several other plug-in cartridges for checkers, reversi and blackjack ($70-100).

Merry Christmas Everyone!
SANDY!

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CIRCLE 220 ON READER SERVICE CARD

Electronic Games, continued...

Other Computerized Board Games

Reversi, popularized under Gabriel's Othello name, is fast becoming popular on the electronic circuit. Gabriel itself has a handheld version with an LCD game board ($60). Fidelity, always eager to compete in computer game competitions, had its Reversi Sensory Challenger ($155) declared the world champion at the second International Tournament of Othello Programs in May of this year, winning five straight games.

Fidelity is also the first to introduce a European game to the U.S. in electronic form, called Dame (pronounced Dah-mah). Dame ($155) is a checker-man's checkers, with a ten-by-ten board and 18 pieces per player to keep an eye on.

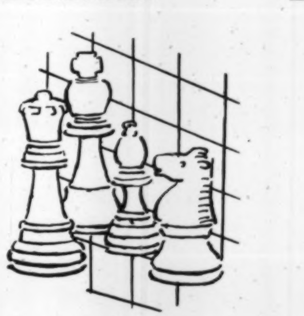
COMPUTER BACKGAMMON

Computer Backgammon by Mattel.

Backgammon, of course, has been an electronic board favorite almost as long as chess. New for this year is Mattel's Computer Backgammon ($90) which utilizes a large LCD screen to show all the stones in play on each pip. Even the roll of the dice and doubling cube value are displayed. It's sure the handiest backgammon game to tote around, since the stones can't slide off a pip if your arm is knocked.

Conclusion

Now that you've seen a preview of the many games available this year, it's always good practice to visit the stores with your favorites on display so you can work with them for a while. You may find that a game that appeals to you at first glance can be too easily mastered—and thus a boring gadget in a short while. Take your time: study the action, the controls, the strategies. Then you will be more likely to find a challenging game that offers hours and hours of fun. ☐



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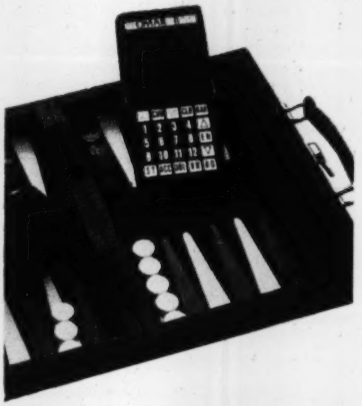
CIRCLE 235 ON READER SERVICE CARD

Omar I Electronic Backgammon

David H. Ahl



Omar II, shown here, uses an LCD display rather than the red LED one used in Omar I. The electronic units are available separately as Omar IV and V to use with your own Backgammon set.

Space Invaders, Galaxian, Pac Man: forget them. I love to watch other people play, but I lack the patience to develop my own eye/hand coordination enough to become proficient.

Chess and Go: the ultimate intellectual games. However, I just don't have the time to devote endless hours to studying and playing the games, or the dedication to become a proficient player.

But Backgammon. Ah, Backgammon. This is my game! Ever since I spent two weeks in Greece, oh so many years ago, and watched the Backgammon games taking place under every shady tree, in every sidewalk cafe, among tour bus drivers waiting for their boisterous throngs, I have been entranced with the game. Fast, Intellectual. An element of chance. Fun for the beginner as well as the advanced player. Here was a game that I could easily learn, play reasonably well, but probably never master.

Please understand, I am not an expert; I play games for fun. And fun was what I had in mind when I brought home *Omar I*, an electronic computerized Backgammon game manufactured by Tryom, Inc.

Selling for a modest $59.95, *Omar I* consists of a leatherette covered magnetic Backgammon set, plus a 3" x 7" x 1/2" computer unit on which one enters moves and receives the moves of the computer opponent. *Omar I* requires either one 9-volt battery, four AA batteries, or an adapter.

In playing the game, *Omar* rolls the dice for one or both players. On your turn, you enter your desired moves through the keyboard in a fairly straightforward manner. When *Omar* moves, it displays its desired moves through the LED display and you must move the actual playing pieces to the pips specified.

Omar prohibits you from making blatantly illegal moves, however, I found that it would allow stupid blunders as well as cheating. For example, if on a double roll you forget to enter your second two moves, *Omar* will not tell you that you forgot, nor will it allow you to go back and enter them before the next turn. In addition, there is no way to take back a move, as is allowed in most of this year's crop of chess sets. In fact, we found the EN key (end move) to be quite dangerous while learning the game. Once it is pressed, anything you have entered previously goes into the computer for good. Period. You have no way of recovering. The EN key ends your turn for good forever. On the fifth game, having ended the first four by turning off the machine after making a stupid blunder and pressing the EN key, I became virtually paranoid about using it. However, as time went on, things became quite natural and I learned to live with *Omar* and its unforgiving nature.

Incidentally, I won very few games from *Omar*. However, there is very little thrill in winning. Something (I could never read exactly what) appears on the LED display for a second or two and then *Omar* returns to rolling the dice. No victory march. No salute. No congratulations. Just "Let's get on with the next game."

Once I learned to live with *Omar*, all went well; except for one thing. *Omar* plays Backgammon very well. Better than I do. I used to fancy myself a reasonably good player. No more. But when *Omar* has turned his doubling cube twice and I, like an optimistic but stupid fool, have continued the game and lost miserably, I can do one thing he can't: I can turn the switch off. But I generally do it only for a second—to give *Omar* a breather—then I challenge him to yet another game.

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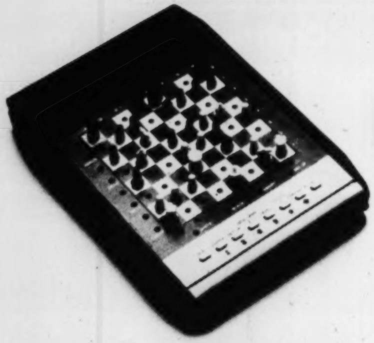

Novag Micro Chess

David H. Ahl

From time to time when *Creative Computing* has reviewed various computer chess tournaments, the name David Kittenger has come up in conjunction with his program, "MyChess." It is an outstanding program and has been victorious at several computer chess tournaments. David has recently gone to work for the Novag people and has incorporated his chess strategy in the Savant and other top-of-the-line chess sets manufactured by Novag including the spectacular robot chess set which actually moves pieces around the board. However, unless one is very serious about chess, it is unlikely that these somewhat pricey sets will find a way into the average home. On the other hand, the "casual" player, perhaps seeking an opponent when no one else is around or wanting a game to play on an airplane, is likely to be attracted to Micro Chess. The unit is just 6" x 4" x 1-1/2" and uses two 9-volt batteries (alkaline preferred).

However, the feature that is particularly attractive about Micro Chess is that it does not take a coded keyboard entry to enter moves. Instead, the miniature pieces have small pegs and are placed in holes in the chess board. To move a piece, the player simply presses down on it. Small lights at the end of the row and column indicate the piece to be moved. The player then picks up the piece and places it into the square where it is to be moved, pressess down, and the lights again shine briefly verifying that the move has been made. A second small light next to the word "black" switches on showing that it is black's turn to move. The chess computer then "thinks" about its move for brief period of time and indicates the piece that it wants to move with a column and row light. You press down on that piece and the computer then indicates the square to which it wishes to move. A "beep" sound verifies the completion of a move.

I am not a particularly good chess player and frequently blunder into stupid positions. Micro Chess is "forgiving" and permits one to take back one black and one white move and commence play from that point. If you are stuck and want help from the computer, it will recommend a move. You can also change sides at any point in the game.

Micro Chess is programmed in accordance with International Chess Rules and does not accept illegal moves. If you try to enter an illegal move, all of the row and column lights flash with the exception of the two lights indicating the illegally occupied square. At this point it gives you the opportunity to reverse the move and enter a correct one. The game employs all standard features including castling, capturing *en passant* and pawn promotion or under promotion. Micro Chess also permits you to set up various board positions and mate-in-two problems.

But what if you are in the middle of a game and dinner is ready, or the plane is about to land? Simply put the memory switch to the on position and turn the computer off. When you come back later, just switch the computer on again and you are ready to enter the next move.

Micro Chess plays at eight different levels including two tournament levels which complete forty moves in 90 or 120 minutes respectively. At the lowest beginner level a move is completed within 2-5 seconds while at expert levels a move could take 15 minutes or more.

I found Micro Chess challenging at its lowest levels of play, although I am hardly one to judge the playing ability of a chess computer. On the other hand from the standpoint of a "user friendly" product design, Micro Chess by Novag is outstanding.

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"Checkmate again, *you boneheaded idiot."*

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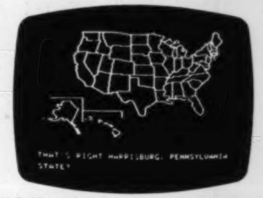
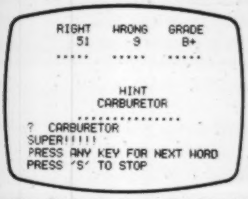


```
THAT'S RIGHT HARRISBURG, PENNSYLVANIA
STATE?
```

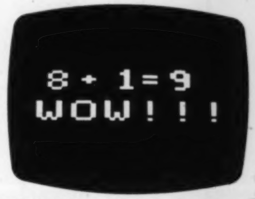
U.S. Map. Identify states and their capitals.



```
RIGHT    WRONG    GRADE
  51       9        B+
.....    .....    .....

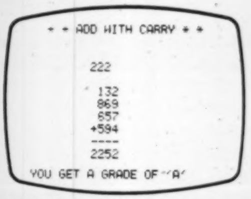

         HINT
      CARBURETOR
   ...............
?  CARBURETOR
SUPER!!!!!
PRESS ANY KEY FOR NEXT WORD
PRESS 'S' TO STOP
```

Spelling. Study aid with your list of troublesome words.



```
8 + 1 = 9
WOW!!!
```

Math Drill. Arithmetic drill and practice with large or small display.



```
  * * ADD WITH CARRY * *


        222

         132
         869
         657
        +594
        ----
        2252
YOU GET A GRADE OF 'A'
```

Add With Carry. Drill and practice on sums requiring numbers to be carried.

Ecology Simulations - I

Disk CS-4706, $24.95

Requires 48K Applesoft in ROM or Apple II Plus

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The POP series of models examines three different methods of population projection, including exponential, S-shaped or logistical, and logistical with low density effects. At the same time the programs introduce the concept of successive refinement of a model, since each POP model adds more details than the previous one.

Tag
TAG simulates the tagging and recovery method that is used by scientists to estimate animal populations. You attempt to estimate the bass population in a warm-water, bass-bluegill farm pond. Tagged fish are released in the pond and samples are recovered at timed intervals. By presenting a detailed simulation of real sampling by "tagging and recovery," TAG helps you to understand this process.

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BUFFALO simulates the yearly cycle of buffalo population growth and decline, and allows you to investigate the effects of different heard management policies. Simulations such as BUFFALO allow you to explore "what if" questions and experiment with approaches that might be disatrous in real life.

CAI Programs Vol II

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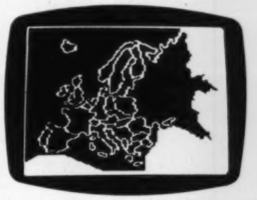
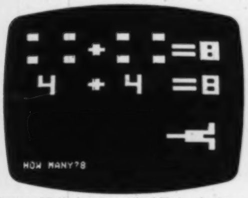


European Map. Identify countries and their capitals.



```
4 + 4 =8

HOW MANY?8
```

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Note: The ecology simulations programs are not available on cassette.

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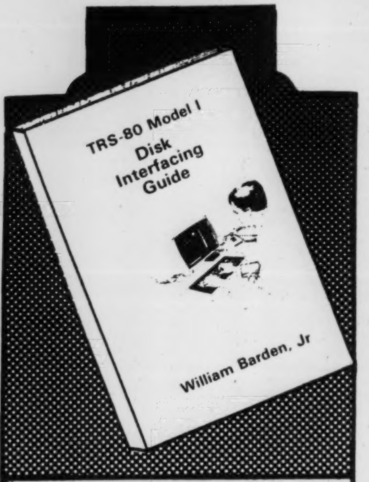

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Electronic Games For Fast Fingers

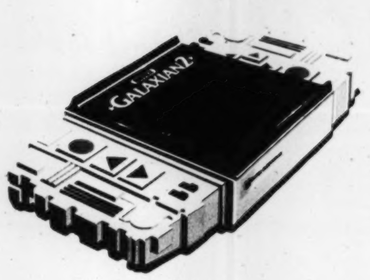
David H. Ahl

At the Summer Consumer Electronics Show we were fortunate enough to pick up two Entex games that will be in the market for this Christmans season. Having been thoroughly humiliated by *Blister Ball*, Creative Computing's new game for the Apple computer, I was anxious to try my hand at Galaxian2, a handheld game from Entex. However, I must confess that it was not with some trepidation that I turned the game on, since several other handheld games have also defeated me soundly. My trepidation was fully warranted. On my first play of Galaxian I achieved a total score of 405.

The game starts with two rows of four aliens in a convoy flying back and forth at the top of the screen. However, within a few seconds they start launching their attack diagonally down across the screen at you unleashing bombs as they go. Unfortunately, the attacking aliens can release a stream of bombs as they attack while you, the defending galaxy ship, can fire only one missle at a time. To add to the excitement and "realism," the galaxy ship (yours) is red, the aliens are blue and they drop red bombs while a green starfield scrolls past from top to bottom during play.

There is a display at the bottom of the screen that indicates how many fleets of aliens have been destroyed. There are symbols for 1, 5, 10 and 100 fleets. The display can indicate a grand total of 299 fleets destroyed. This seems more than enough, since in all of the games that we played, the maximum number of fleets destroyed was sixteen. The game has two skill levels and a digital score indicator at the top of the screen which displays scores up to 9999 points.

The game also has excellent sound effects. Alien movement is accompanied by a click-click-click sound while bombs and missles are accompanied by appropriate explosion noises and, at the end of the game, a cute little tune signals that "you have been wiped out."



Galaxian2 by Entex.

Sound good? It is, but there's more. This is a two player game. In the two-player mode the second player can control the movement of an attacking alien left, right, up and down. In addition, he can fire bombs onto the galaxy ship.

To top it off, there is a demonstration mode in which the game will play by itself. Parents will appreciate the sound/mute switch which allows the game to be played either with or without sound.

We play tested the game with our entire "eclectic panel" and, as was the case with several of the video games, our ten-year old boy regularly beat everyone else at Galaxian2. The game is ruggedly constructed of gray plastic measuring 8" X 4" X 2" and uses four C-cells or a battery eliminator. We feel it is one of the best.

Space Invader, like its big brothers (arcade and computer versions) has rows of aliens traversing the top of the screen dropping lethal bombs on your tank below. Two keys move your tank back and forth and a fire button launches beams from your cannon. As fewer aliens remain, they move faster and lower. The game is for one player and has two skill levels. The display is one color (red) and a three-digit score is shown at the top of the display. It uses six AA batteries and does not have provision for an eliminator.

Enter Self-Destruct Password.
Star Trek
Care to Play Another Game?
Star Trek
Roger Roberts

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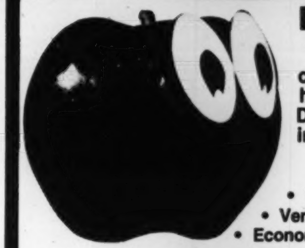

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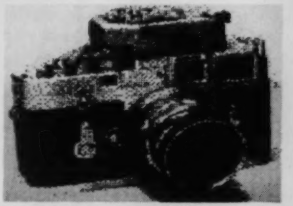

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Fast Fingers, continued...

Football

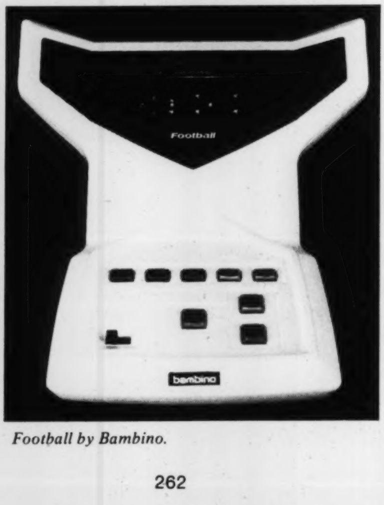
Our introduction to this game came when I accidentally knocked it off the counter at the Toy Fair and it went crashing to the floor just as a president of Bambino was coming over to shake my hand. Heart in my stomach, I tried to shrink from the scene. However the president took it as an opportunity to pick the game up, toss it six or seven feet in the air and let it land on the floor then pick it up and play a game of football. In contrast to the electronic games of just a year ago and even to those of other manufacturers these Bambino games are Tough.

This is one of the most complex football games I have seen and rivals the best video games. A short review can't possibly do it justice. Basically you as the player control the forward as well as the right to left motion of the ball carrier as he runs the ball down the field. You have the option of following your blockers or using them as a fake and running down the other side of the field. Prior to each play you specify which of three formations you wish to use in the play. On each fourth down you have the option of running, passing, punting or attempting a field goal. A pass has three possible outcomes: complete, incomplete, or intercepted. In the case of an interception an automatic run back will take place.

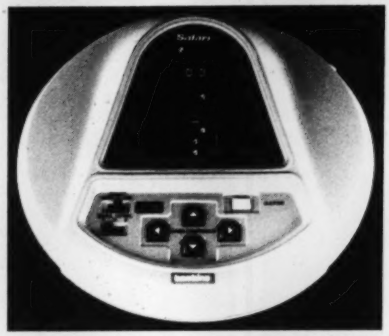
At the end of each play, the game statistics automatically appear on the display screen in the following order: 1. Down and Yards to Go, 2. Field Position, 3. Home Team and Visitor Team Score, 4. Quarter and Time Remaining.

On the highly detailed display the home team is blue, the visitor team is green and the ball is red. The display is amazingly detailed; you can see the ball fly, the blockers block, and the players move their arms and legs.

Like the other Bambino games there are no predictable patterns to memorize. The microprocessor is capable of performing over one hundred million different plays.



Football by Bambino.



Safari, our favorite Bambino game last year, is still available this season.

Of the many people that play tested this game, a 9-year old boy proved that he had the quickest reflexes of the group and proclaimed "This is the best hand held game ever."

Race 'n' Chase

In this Bambino game you control a police car and guide it from lane to lane to avoid collision with oncoming obstacle cars and bullets fired by gangsters. The more obstacle cars you avoid hitting the closer you come to the gangsters. When you get one car length behind the gangsters you may press your arrest button and make the arrest.

It's not easy. Unlike some computer games where you can anticipate the patterns, in this game there are over one hundred million computerized patterns of gangster cars, obstacle cars and firing.

The game has eight different sound effects which accompany every different action, although we've only heard the "We got 'em" once as a result of apprehending the criminals.

This rugged game has a self-playing attract mode and three skill levels. The graphics are highly detailed and brighter than most other hand held games. Uses four C-cells or A/C adapter.

Bank Shot

Bank Shot Electronic Pool from Parker Brothers features a mini pool table surface complete with pockets and red LED balls. Since the surface is small, only six balls appear in the rack, and a complete game consists of three racks. The game keeps track and displays the cumulative score at the end of three rounds.

The player positions the cue and shoots by pressing a combination of three control buttons. At the beginning of a game, or after a scratch, the cue ball may be positioned by means of the "ball up" and "ball over" keys. Abbreviated instructions for shooting and for selecting a game are included on the bottom of the game—a very thoughtful touch.

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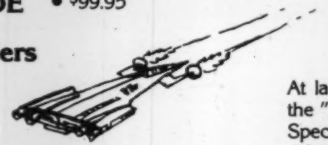

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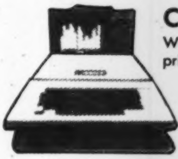

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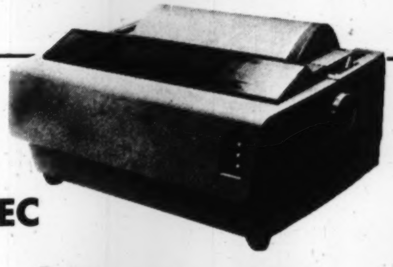

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Fast Fingers, continued...

The real pool sharks on our panel were disappointed in the lack of realistic action. There is, for example, no such thing as english, and it is difficult to assess the effect of your shot because all the balls look alike. You can't really tell whether the ball that fell in the pocket was the one you were aiming for or another that just happened to be in the way.

In conclusion, we would link Bank Shot to certain canned vegetables; they're all right as long as you don't compare them to the real thing. As a game that requires skill and practice rather than speed and dexterity, Bank Shot is good for hours of solitaire or two-player competition. As a substitute for an eight-foot slab of slate in your living room, it leaves a lot to be desired. $45.

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Scrabble Goes Electronic

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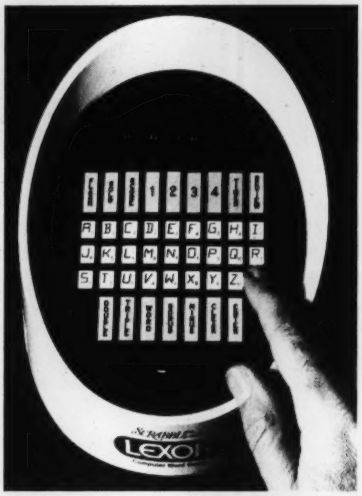

Lexor

Lexor is a "computer word game" closely related to the Scrabble board game. It has three modes of operation. In Flash Mode (for one to four players) the object of the game is to form as many words as possible from seven letters displayed on an L.E.D. display, before time runs out. Players alternate turns. The winner is the player with the highest score after an agreed number of turns. Lovers of Scrabble will find this game interesting and fun, although, at times, frustrating. As with the actual game of Scrabble it is possible to get seven consonants from which no word can be formed. In play we found most players generally making from seventy to one-hundred points worth of words per turn. Hence, if on one turn a player gets all consonants and has to take a score of zero it puts him at a serious handicap. In the Flash Mode the game can be timed either 60, 120, or 180 time units (roughly 1 second).

In Flash Mode, children found it particularly frustrating to get a combination of seven consonants. As they were usually playing on the longest time setting this meant that they would have to wait approximately three minutes to go on to the next turn since there is no way of bypassing a turn and thereby speeding the progress of the game.

In Solo Mode, Lexor displays the complete Scrabble crossword game letter distribution. The object of the game is to find the highest scoring words. There is no time limit in Solo Mode.

The third mode is Score Keeper Mode in which you can use Lexor to keep score while playing the Scrabble crossword game. Lexor computes the score for each turn and keeps a running total for each player. We found this was the least useful and somewhat cumbersome to use.

Sensor

You would think from the name of this game, Scrabble Sensor Electronic Word Game, that it is a word game. Well, yes

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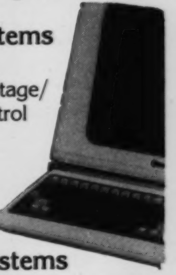

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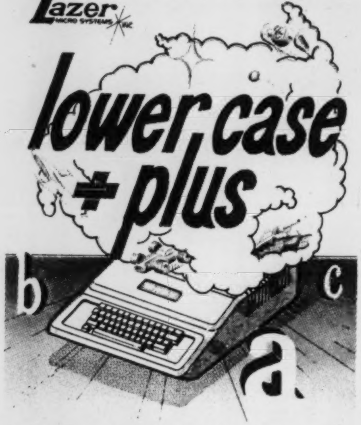

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Scrabble, continued...

and no. It is a word game in the sense that the player enters combinations of letters (probably words, but not necessarily) for the other player to unscramble. The game gives clues, exactly the same as those given in Mastermind game, that is letters that are correct and letters that are correct and in the right position. The second player may take any number of guesses to unscramble the three to seven letter word entered by the first player. However, the score sheets provided only allow for twelve guesses per column (although there is nothing to stop one from using several columns in guessing a word).

Sensor also has a solitaire mode in which one player can guess four letter words which are stored in the memory of the game.

Sensor has two modes of play for two players. In the first, one player guesses a secret word entered by the other. In the second mode both players alternate guessing secret words entered by their opponent.

At the end of play the game blinks and beeps as a reminder to turn it off. It requires one nine volt battery or eliminator.

Readers Digest Q & A

This essentially is a multiple choice quiz game with some variations. Two booklets of quizzes come with the game compiled from Readers Digest. The first is a book of ninety-four 20-question quizzes which are reprints of the column "It Pays to Enrich Your Word Power!" The second is a book of sixty-two quizzes on everything from sports to capital cities to home truths to movie stars, nick names, comics, astronomy and the like. The use of the quiz material from the Readers Digest, more or less positions the unit for ages 16 and over. Although the unit was fascinating to younger children, they quickly lost interest when they found only three quizzes in the Brain Power booklet which were within their reach.

WORD POWER
Q&A

In Single Mode, the game is simply an automatic scorekeeper as you go through each twenty question quiz. Double Mode for two players is considerably more interesting. As the first player goes through the quiz, some of the questions are selected as bonus questions. This means the value of the question is doubled. If you don't want to risk losing twenty points you can press pass and move on to the next question. Even more interesting are the questions marked Duel. In this case the player does not answer the question but rather enters a guess as to how his opponent will answer the question. A correct guess yields 50 points while an incorrect guess loses 30 points. After the first player has finished the game the second player goes through it also being presented with Bonus and Duel questions although, of course, on different questions. So what it boils down to is both knowing the subject matter as well as your opponent.

Coleco has prolonged the life of Quiz Wiz for several years by coming out with four to six new quiz booklets per year. If Selchow & Righter elect to do the same thing with this Q & A game it should be a winner for many years to come.

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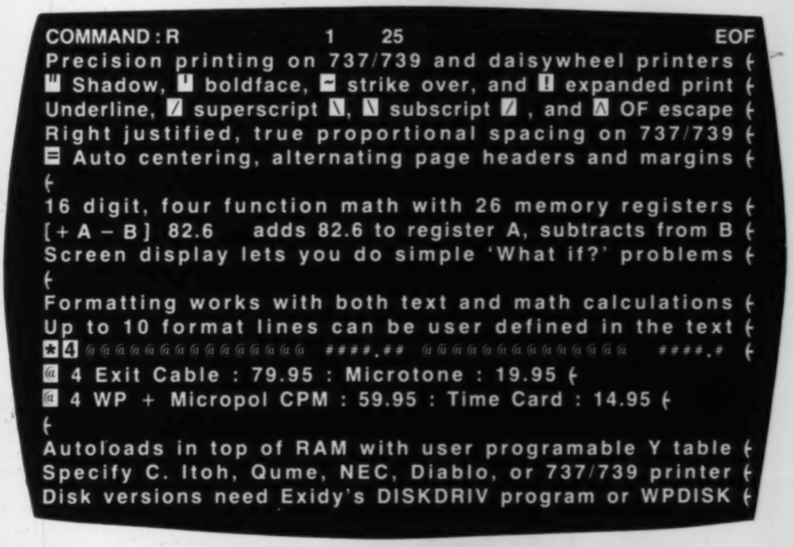

```
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Adventure on a Board

Dark Tower

Betsy Staples

Retrieve the Ancient Magic Scepter that has been stolen by the tyrant king—that is the challenge of Dark Tower from Milton Bradley. To accomplish this feat you must travel around the game board, collecting the keys to unlock the tower and reinforcing your army.

The game comes with a cardboard playing board, a set of plastic buildings and markers to place upon it, and the dark tower itself, an electronic castle with a touch sensitive control panel, LED digital display and three back-lighted picture displays.

Each time a player makes a move on the board, he presses an appropriate key on the control panel. The tower responds with one of several "musical signals" and the picture display depicts the action taking place.

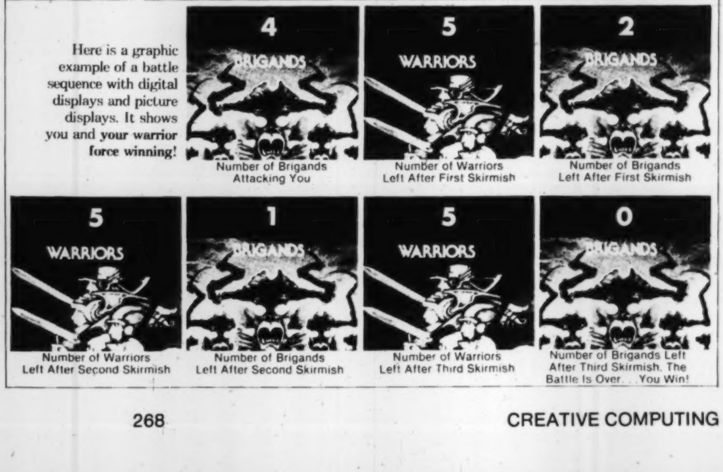
For example, a given move may lead you into battle. At the sound of battle horns, the display tells you how many brigands you must defeat. As the battle progresses, you receive reports on the number of them versus the number of your warriors remaining. You may stop the battle at any time if you are losing, but if you win, you may take additional gold or other treasures away with you.

During the course of the game you may acquire additional gold, warriors and food. You may also trade your bags of gold for certain safeguards. A beast, a healer and a scout each protect you from certain evil happenings.

Of course, the tower knows which safeguards you have, and we were dismayed to discover that it uses that information against you with impunity. For example, if you have no healer, you will find yourself beset by repeated attacks of the plague, which will soon deplete your warrior force. This is very frustrating, and we think this feature would have been better programmed to deal out the disaster in a more random fashion.

The game comes with a 46-page instruction book, and the first time we played the game we spent about 45 minutes trying

Here is a graphic example of a battle sequence with digital displays and picture displays. It shows you and **your warrior force winning!**



Number of Brigands Attacking You

Number of Warriors Left After First Skirmish

Number of Brigands Left After First Skirmish

Number of Warriors Left After Second Skirmish

Number of Brigands Left After Second Skirmish

Number of Warriors Left After Third Skirmish

Number of Brigands Left After Third Skirmish. The Battle Is Over. . . You Win!

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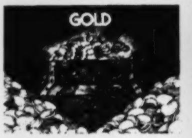
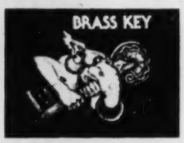
Dark Tower, continued...





to familiarize ourselves with the instructions before playing the game. At the end of that time, we were so confused, we decided just to play and look things up as they occurred. This, it turned out, would have been the best strategy from the beginning. In fact, a much better format for the book would have been brief instructions for actual play and a table or list describing each event and its consequences. We cannot imagine a child retaining interest in actually playing the game after reading the instructions.

While we did find Dark Tower frustrating at times, we enjoyed playing it. It is definitely the sort of game that children and adults will enjoy playing again and again—a good pastime for a rainy afternoon. It also gives those of us whose eye/hand coordination leaves something to be desired a chance to enjoy the world of electronic games.

Dark Tower may be played by from one to four players, and includes three levels of play. (As usual, we found the first level of difficulty quite challenging enough to satisfy us.)

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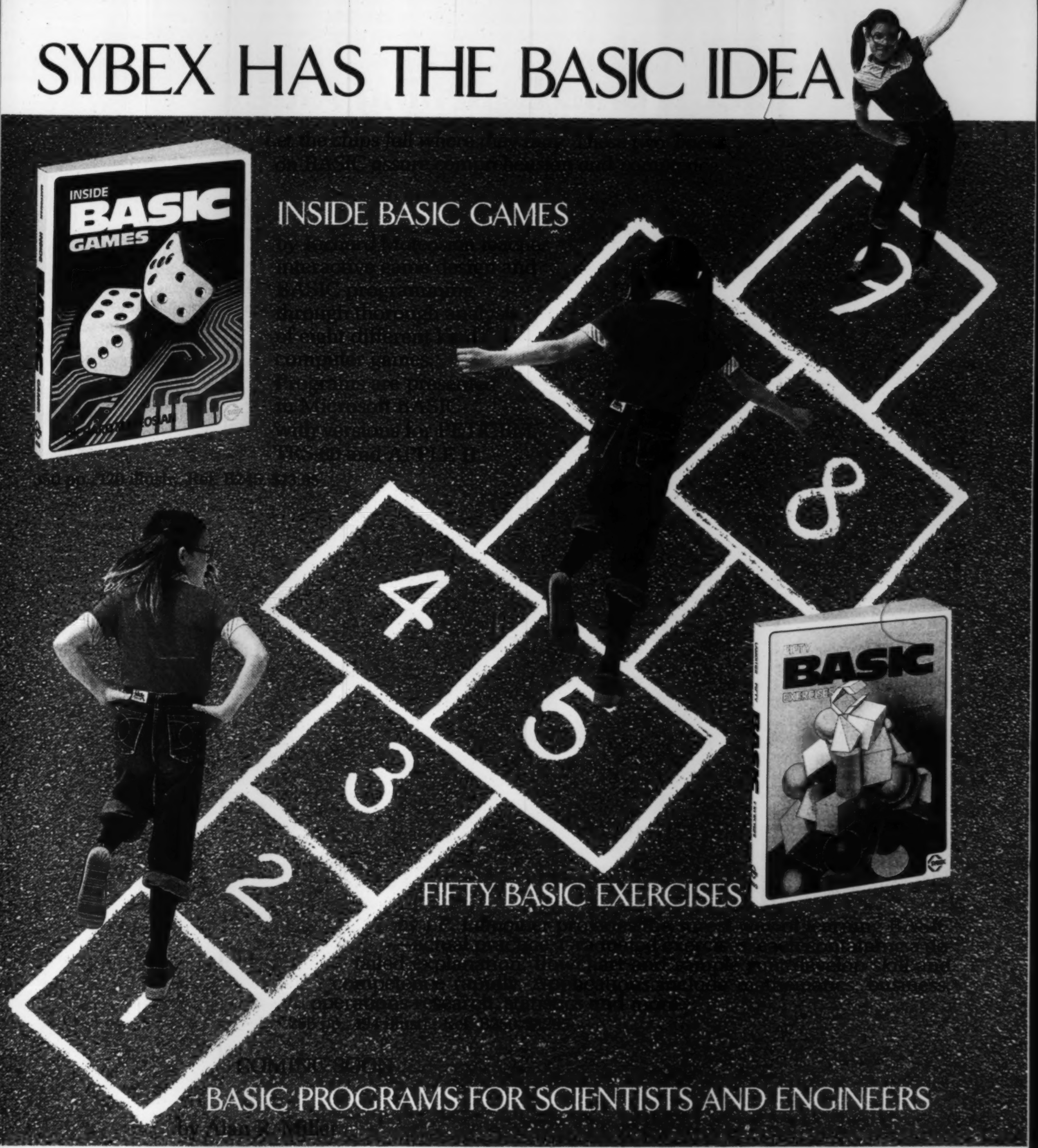

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Electronic Learning Aids

Danny Goodman

When the Texas Instruments Little Professor appeared in 1976, I wished I could have been a kid again so a patient tutor with 16,000 problems stored in his little silicon brain could help me learn my arithmetic tables.

Since then, my wish has not come true, but the desire is even stronger as an entire new industry—electronic learning aids—has produced some of the most technologically advanced consumer products in the world for kids to play with and learn from. For example, the first mass market product to employ speech synthesis was the TI Speak & Spell. Furthermore, electronic learning aids have capitalized on the benefits of programmability by interchangeable modules more than almost any other category of consumer electronics products.

Parents are learning, too. They're learning that these gadgets are not "crutches" to help their children do multiplication tables without having to think. On the contrary, the electronic learning aid is a problem or question generator. The child must come up with the answer—just the way it was for us when we went to school.

More importantly, the kids seem to treat the experience as fun and challenging, rather than as a learning experience. A child will readily play an electronic math game; but how many second graders voluntarily pick up a spelling quiz book?

As in other electronics categories, programmability adds value to the main console. Upgraded modules can take a math student through several grades. For multiple-child households, first and sixth graders can study different spelling levels with the same unit.

And let's face it, adults are mesmerized by these computerized little devils, too.

Texas Instruments' Speak & Spell with interchangeable modules.

Let's take a look at some of the new electronic learning aids. They are truly fascinating.

Texas Instruments continues to ride high on their speech synthesis applications in learning aids. Last year's new models, Speak & Read and Speak & Math, will be more readily available this fall and Christmas. Speak & Read is intended for pre-school through third grade levels, with eight additional modules available that emphasize problem areas such as prefixes, suffixes and adverbs. Several of these modules were developed by TI in conjunction with Scott, Foresman, the textbook publisher. Speak & Math, on the other hand, is not programmable, but makes up for it by containing over 100,000 math problems for grades one through six. One exercise voices problems without anything in the display. You must answer them correctly before Mr. Speak & Math will give you an oral pat on the back. If you've been used to only seeing problems in a display, this task is a lot harder than you think.

For pre-schoolers, TI has a brand new speech unit called Touch & Tell ($60). After sliding in a colorful 9" x 9" overlay, the Touch & Tell will ask you to identify objects on the card. By gently touching any object on the overlay—triggering a touch-sensitive "keyboard" underneath—you hear the name of the object and whether you identified it correctly. Interchangeable modules and overlays give the child practice in identifying parts of the body, shapes, numbers and animals (complete with Mr. Touch & Tell trying to make the animal sounds).

It is always pleasing to see a programmable learning aid continually supported

---

Danny Goodman, 3200 N. Lake Shore Drive, Suite 2208, Chicago, IL 60657.

SELECTED ELECTRONIC LEARNING AIDS

Manufacturer	Model	Price	Age Group	Learning Activities	Programmable Modules
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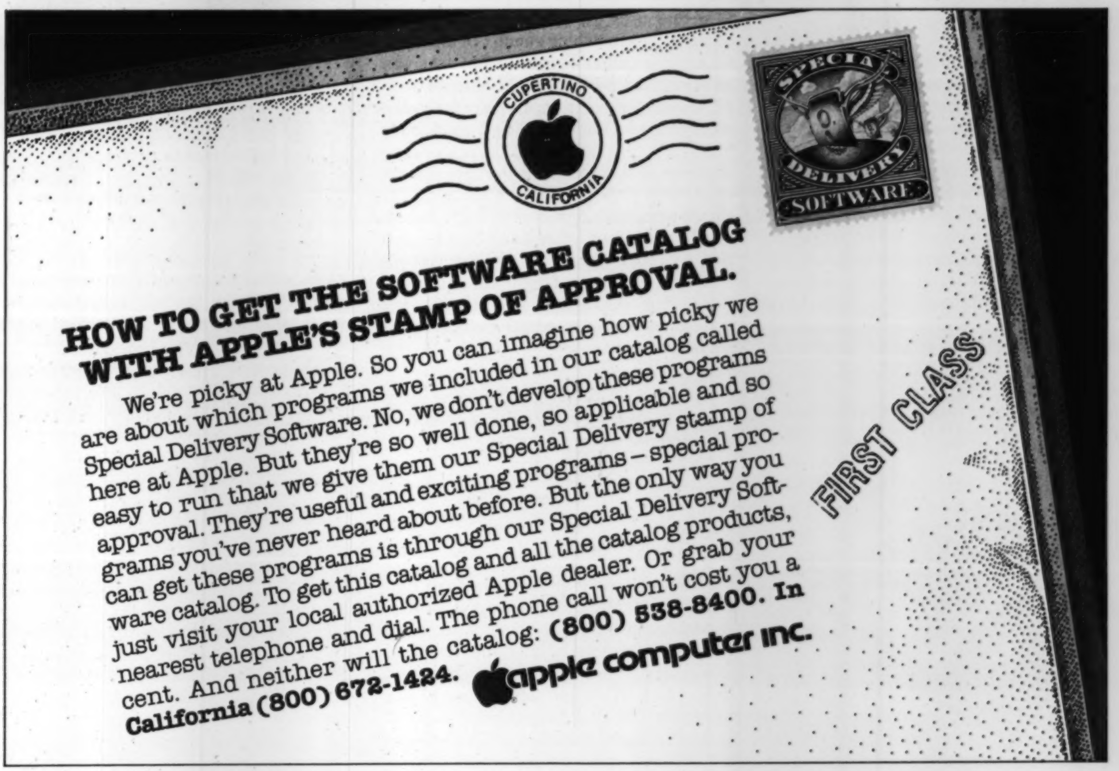
Coleco	Magic Touch	$15	Preschool	Matching Game	not available
Mattel	Children's Discovery System	$125	6-11	Basic Skills and General Knowledge	8 modules
Texas Instruments	Speak & Read	$95	Preschool-3rd grade	Reading, Vocabulary, Comprehension	8 modules
Texas Instruments	Speak & Math	$85	Grades 1-6	Arithmetic, Math Concepts	not available
Texas Instruments	Touch & Tell	$60	Preschool	Vocabulary, Concepts	4 modules
Tiger	K28	$100	Kindergarten-8th Grade	Reading, Spelling, Math	6 modules
Video Technology	Lesson One, MarkII	$50	6-12	Spelling, Arithmetic	not available



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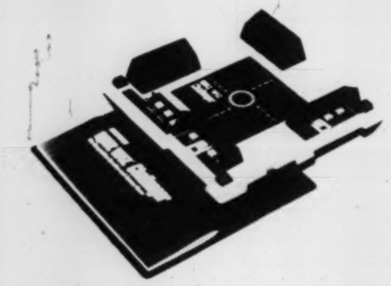
Learning Aids, continued...

by new and broader software. It means that early hardware buyers don't own an instant dinosaur, and that prospective owners have a wide choice for their new units. Coleco has added six new cartridge/quiz books for the Quiz Wiz at under $10 each. The total is now twenty-five—an impressive collection of more than 25,000 questions! New subject areas are more sports legends, monsters/ghosts, confusing words, movie/TV trivia, rock 'n roll, and the Bible. A new four-player console, Quiz Wiz Challenger (under $60), accepts all 25 cartridges and sets players against each other in a race to accumulate correct answers.

For a younger crowd, Coleco has a new activity called Magic Touch (under $15) that uses the body's low level conductivity in a matching game. For example, an activity called Things to Eat asks you to match the pictures of 12 animals with 12 foods they eat scattered around a colorful scene. Each item has a conductive black dot terminal on it; corresponding items are connected inside the card. Touch the rabbit with one finger and touch the carrot with the Magic Touch wand, which you hold in your other hand by its metal plates. Completing the circuit through your body makes the red light on the wand shine. The concept is very simple, yet youngsters and most adults are convinced it's magic.



Quiz Wiz Challenger by Coleco.

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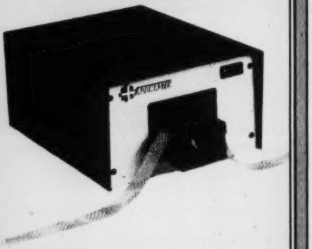

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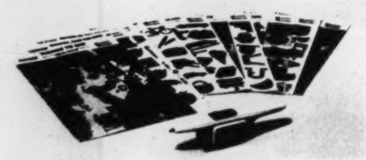

Magic Touch by Coleco.

Learning aids that do more than quiz kids on just math or spelling have a broad appeal because there is a greater perceived value in a variety of activities within a single unit. Video Technology's Lesson One, Mark II (about $50) is such as a machine, with an alphanumeric keyboard and seven-digit LED display. This learning aid has ten different activities ranging from arithmetic drills to a hangman spelling game, with a sound chip to add more interest. As a budget multi-subject electronic learing aid, Lesson One is a good buy.

Lesson One, Mark II by Video Technology.

K28 talking learning computer by Tiger. Carry-along case style.

Robot-like speech synthesis (the phoneme programmable kind) is the main feature of Tiger Electronics' K28 talking learning computer (about $100). Because phoneme-based speech uses less memory than TI's linear predictive coding technique, the little K28 claims a 1500-word vocabulary (vs. 200 for Speak & Spell). As its name implies, the K28 is intended to tutor children from kindergarten to eighth grade—the latter with the help of optional modules (about $25 each) in subjects like advanced spelling, math (fractions, metric measurements, temperature conversion), advanced grammar, geography (with workbook) and word games. The membrane keyboard has both alphabetical letters and a separate numeric keypad. Digital readout is accomplished by a nine character, 14-segment alphanumeric VF display. Two case styles are offered—something I've never seen before. One, in blue plastic with an integral carrying handle on the side, is meant for younger kids. The second sports a silver-grey plastic case, no handle, and sloping keyboard something like a computer console. This style apparently won't embarrass a fifth grader when he or she walks to school with it.

A super-deluxe programmable learning aid, The Children's Discovery System ($125) by Mattel, doesn't talk, but it does have the most interesting matrix LCD display of any learning aid. The arrangement allows for not only two rows of eight alphanumeric characters, but also simple graphics for activities like reflex and coordination skills in the optional Arcade Action module. The basic unit includes the ability to sound music notes and create graphics on the display. A math module comes with it, and eight others are available covering words, art, music, science, sports, and history (about $20 each). Special keyboard overlays come with most modules. It is certainly the most attractive self-contained learning aid around, and has the promise of being one of the best software-supported in the future.

Children's Discovery System by Mattel.

As we've seen, the new electronic learning aids are not only sophisticated, they can be downright expensive. Yet consumer interest in them remains high, perhaps as parents look for ways to combat reports of declining quality in formal eduction. One point is clear, however: these children are growing accustomed to microprocesor-based technology from a very early age. They will likely take new developments for granted, while we older folks still stand back and say "Gee whiz! ☐

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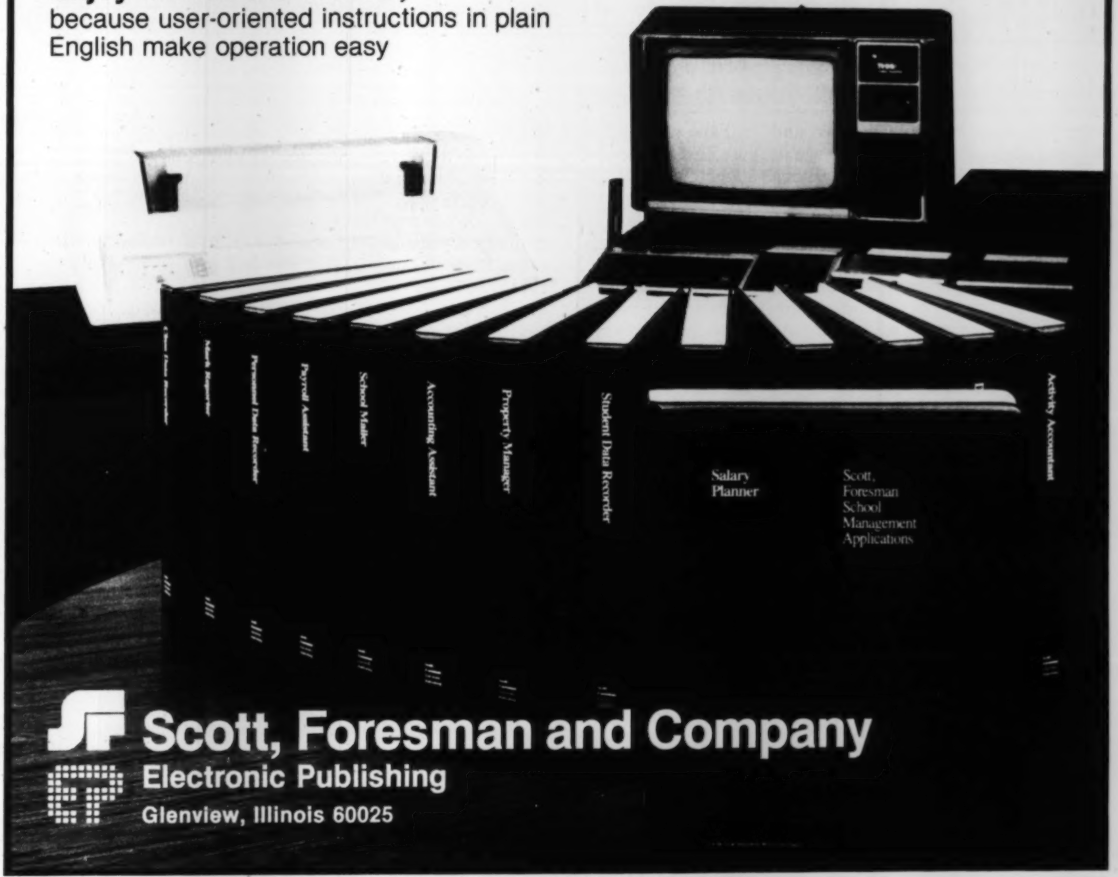
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Video Products for Computer Users

Michael Heiss

In order to capsulize events and eras we often find the press using catch phrases that eventually live up to their billing. After all, as any *Creative Computing* reader knows, we are certainly living in the "computer age."

These days the pet cliche seems to be the "video revolution." You can't pick up a newspaper or magazine without reading how the videodisc or home video cassette recorder will change your life.

Why not, then, combine the two and bring your computer into the video age to take advantage of both technologies? Alone each is powerful, but when combined they form a partnership that may send the pundits back to their pads and pencils for yet another new cliche.

The array of equipment available to bring video under the command of your computer is growing daily as are the numbers and types of different formats and technologies. As someone who has just recently gone through the trauma of a first time computer purchase, I can understand how bewildering it can be to delve into a new system even when you are familiar with the basics of a similar area. Since some of my computer-oriented friends helped me in my search for the right computer for my needs I thought that it would only be fair to return the favor through these pages by introducing them, and you, to the different types of video equipment available that might be used in conjuction with a computer for business, fun or learning.

The number of video recording formats, tape sizes, disc systems and options is almost the same as computer DOSes, operating systems and programming languages. Each has its own high points and drawbacks, some of which are important when considering computer use, some irrelevant. There is also a very important distinction between items designed for consumer use and those intended for "professional" or industrial use. Video has gained entry to the living room as well as the factory and school room and there are product differentiations to contend with.

Tape vs. Disc

Just as with computers, video uses two methods of storing information, tape and disc. The important difference, however, is that while digital information for computers can easily be stored on hard or floppy magnetic discs, the large amount of bandwidth needed for the recording of an analog video signal limits the use of magnetic materials in video to tape recording. In video, the disc is always a medium used for the playback of programs prerecorded and encoded on the disc by a complicated and expensive process.

That leaves you with a parallel to computers: if you want fast access to any part of a program you have to use a disc (except, again, that currently video discs don't record—they only playback). If you want recording and playback inexpensively you go to the linear recording method of video (as opposed to data) cassette. You can record your own programs on a videocassette recorder, but it will take longer to have your computer search out any portion of the tape then search a videodisc.

If all you want to do is playback then discs are the answer. If you are looking to create an adventure game based on a movie that is available on disc, then there is no problem.

For more customized applications, however, you will have to record the program on tape, have it mastered to disc and finally have the discs replicated. If you happen to be GM, Ford or a big industrial concern that's no problem; the costs are reasonable when you are producing programs to be seen in 10,000 locations across the country. For a small business or educational institution, however, the expense of first preparing a show, mating it to a computer routine and then mastering and duplicating discs may be prohibitive. Tape or disc? It depends on your needs for access time, custom or off-the-shelf programming, and, most important, your budget.

Consumer vs. Professional Equipment

In the last few years about the only things that haven't skyrocketed in price are electronics products, which include both computers and video gear. Computers have had the advantage of new technological developments to help keep their costs stable, while video has benefitted from the fact that discs and VCRs have become mass market consumer items. Hence, the economies of large scale production and marketplace competition have kept costs down. But the difference between a consumer video machine and a professional deck may still be in the thousands of dollars. Is it worth it?

As with most such things, the equipment intended for use in the workaday world is built to take more use than home gear, and that's important when you consider that video units are as much mechanical as they are electronic. There are other differences here, however, that are of importance. Pro gear is usually designed for use with remote control systems, so you'll find it much easier to interface a pro deck to your computer system than a consumer one. In video cassette there is currently only one consumer deck that

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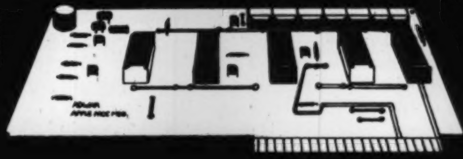

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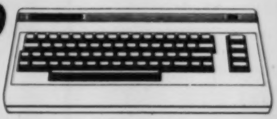

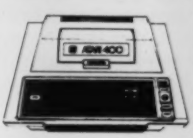

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For simple applications, however, a home VCR may be just what you need. They'll playback prerecorded tapes, record programs off the air or from a camera, and most have some sort of remote control that can be hooked up to a simple interface. A VCR, then, may be quite adequate as long as your application doesn't need to fetch segments from portions of the program at opposite ends of the tape. The price, of course, is also a consideration. Home VCRs are often heavily discounted to under $1,000. Pro discs and VCRs are more expensive to start, and unless you're buying a large quantity for a network, discounts are smaller and harder to come by.

Disc Equipment

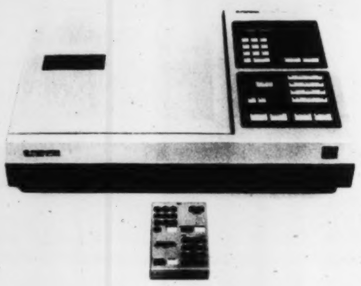
It is hard to ignore the disk for video playback, it's advertised almost everywhere. Before purchasing one you should know about the four flavors available: LV, VHD, CED and optical transmissive. Each has its partisans and two of the systems have already been used in computer interfaced systems; some models even have their own onboard microcomputers and RS-232 or IEEE-488 control ports. Within bounds, all of the disc systems allow you to search to a particular spot on the program quickly, making them ideal for applications involving branching. But remember, to do this with your own material you will have to pay a heavy price to produce the program, format and code it to both the needs for the disc and your computer and then duplicate the discs. The specifics:

Laser Vision Optical Reflective Discs

Known to consumers in the Magnavision or Pioneer LV units, this system uses information optically encoded on a plastic disc which is reproduced by means of a lasar beam bounced off the surface of the disc. Two audio tracks are available, and each video frame has an individual address permitting an appropriately equipped player to search out any of the 54,000 frames on a side.

Discs produced in the CAV (Constant Angular Velocity) mode hold up to 30 minutes of programming per side and use a recording technique which permits freeze frames, reverse, fast motion and slow motion. To increase the playing time to one hour per side a different technique (CLV for Constant Linear Velocity) is used, but because these discs rotate at speeds from 600 to 1800 rpm, they give up the "fancy play" modes to get the increased recording density. If you want to create games with a movie disc, be warned that most new titles are recorded in the CLV format, which may limit their usefulness since the extra half hour costs you many of the better points of the system. All industrial and most educational programs are recorded in the CAV mode.

The Pioneer VP-1000 comsumer player may be a best bet in this format. It has a wireless or wired remote with a keypad that is used to access the frame and/or "chapter" numbers encoded on the discs. Furthermore, three interfaces have recently been announced that permit a computer to control the player functions.



Pioneer VP1000.

The Magnavision 8005 from Magnavox is less expensive than the Pioneer, but it does not have frame or character search capability so it would be of limited value to computer users. This is a simple-to-use consumer deck.

Discovision Associates is a joint venture of IBM and Philips/MCA, and, as you might expect, the players they sell made by Universal Pioneer (Japan) are more friendly to computer users. Commercial interfaces are available to link their PR-7820 player to home computers, the new PR-7820-2 even features an RS-232/IEEE-488 port to allow for direct control of the built-in F-8 microprocessor. If you are using a specially pressed disc prepared for these players, the machines will read instructions off the disc and store them in memory for use with branching routines. For under $2,500 these are very sophisticated units if you have the software to go with them. Evidence of this is their use by every GM dealer in the country for sales presentations and dealer training.

Sony doesn't make a consumer disc unit, but they do have an industrial strength LV player, the LDP-1000. It shares many of the features of the Discovision units, using a built-in Z-80 system. Sony is interested in the industrial disc market, and they also press their own discs in Japan at a price that might encourage medium size users to look into their version of the system.

CED Capacitance Discs

This is the system popularized by RCA for consumer use. There is a wealth of movie software available, but at present potential for computer interfacing is small. The RCA unit has no provision for remote use at all, so you would have a hard time marrying it to a computer. The units soon to arrive on these shores from Japan's Sanyo, Toshiba and Hitachi have remote capabilities, but the basic nature of the system causes other problems.

CED uses discs with grooves and a stylus assembly to read information. This allows for simple, cheap players, but the stylus is removed from the disc during search modes so the system must make an educated guess to arrive at placement for the next scene. Still frames are also a problem at present, and there is no slow motion. CED systems are adequate for entertainment, but just not appropriate for computer control.

VHD Discs

This system is scheduled for commercial introduction in early 1982, and it might be worth waiting for. Here a stylus is also used, but it rides above the disc rather than in contact with it, so there is easy search to any frame number or encoded chapter stop, as well as fast and slow motion. Two audio tracks are available (CED only has one at present), and most machines have keyboards for frame search. Some also have remotes which might make interfacing even easier.

The specifications of this machine make it seem like the perfect compromise between the fine quality and technical sophistication of the LV system, which is high in cost and occasionally troubled by disc imperfections and the simple approach of CED. At this writing the manufacturers are still locking in their designs for the final production units so we are unable to report on the machines which will finally make it to the market.

We can tell you that GE, Panasonic, Quasar and Sharp have all shown prototype VHD systems and you can be sure that their advertising will let you know when they are available. From our previews of their pre-production models in early summer we can tell you that the Sharp machine with its external "trick play" box seems to be the one that will be the most easily interfacable for computer use. We suggest you look at it when it appears this winter.

Optical Transmission Discs

The French electronics giant Thomson-CSF has been quietly marketing a video disc system for some time now. It is designed strictly as an industrial unit, so if you have access to or can afford the production of software for it you might want to take a look.

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Video, continued...

Thomson-CSF TTV-3620.

It uses an optical technology where the lasar reads through the disc rather than off it, permitting both sides of the disc to be accessed without flipping it over. Thus a 30 minute per side disc gives you full-featured access to an hour of programming. Their model TTV-3620 has full still, slow and fast modes, wired remote and an IEEE-488 data port. The maximum access time to any frame is under three seconds—the fastest around.

You're not likely to find any movies for this machine, but for serious applications it has found many homes around the world.

Videocassette Equipment

This year videotape is celebrating its 25th anniversary, and doing it in style. Not only has tape in 1/2" formats taken off as a consumer "must have," but the 3/4" cassette systems now dominate broadcast newsgathering applications, and both 3/4" and 1/2" systems are popular for educational use and industrial training. Now too, a super small 1/4" cassette format has just been introduced.

This means that there is a wealth of equipment available, some of which may have characteristics that are right for your computer-driven application. Unlike discs, each video frame is marked on tape, regardless of format, with a "frame pulse." Some machines count these pulses to allow you to locate frames; all can be made to do so if you have the ability and patience. Thus, any frame can be located if your use allows you to wait. If you are recording custom programs keep this in mind when planning segment order so that your user doesn't have to wait too long for the next scene to appear.

For more accurate scene location you can record an industry standard SMPTE time code on a second audio track and give each frame a precise address location. That's how video program editing systems work—their use of LSI-11 based system was the first computer interface to video.

3/4" U-Matic Systems

Originally intended by Sony as a consumer system, U-Matic turned out to be too expensive and ahead of its time for that use, but it has found a home in the world of broadcast and education. These machines are already in daily use with computers in editing systems all over the world. This means that on many machines you'll find built-in remote outputs with frame pulse counts to use with a commercial interface or one of your own design. There is a one hour limit to 3/4" cassettes, but for most non-entertainment applications that's more than enough. All machines have two audio tracks and still, while the broadcast units offer search modes in forward and reverse with picture.

Sony's VP and VO series units are industrial players and player/recorders, respectively. The 2011 and 2611 offer an external controller with a keyboard for searching. The information to/from this controller is readily available at a jack at the rear of the machine. Their BVU series machines are broadcast quality units designed for editing, so they can take the pounding of constant use—expensive, but worth it.

Panasonic also has a series of machines designed for editing, and those are the ones you'll find easiest to interface. The AU-700 is a broadcast deck at $9,250, but many of the same features can be found for under $5,000 in the NV-9600 and NV-9240.

The Panasonic NV-9600.

JVC's U-Matics have recently been redesigned with a transport that is easier on tape. The CR-6600, designed as an edit source deck, would work fine with external interfaces and lists for under $4,000.

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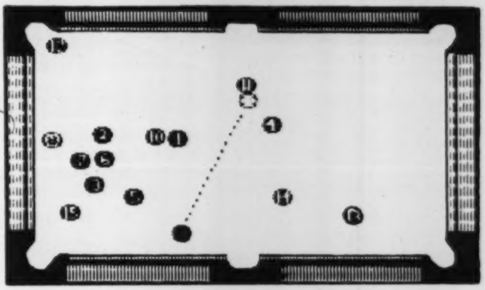

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1/2" Beta Systems

There are two popular 1/2" systems, Beta, originated by Sony and VHS. Both do the same thing, but they do it in different ways so as to make them incompatible. Both also have consumer and industrial models. Since Sony's Beta was out first, we'll take a glance at it first.

Consumer Beta units are available from Sony, Zenith, Sears, Sanyo, Toshiba and NEC. All have three speeds and will record up to 5 1/2 hours. Of course, there is plenty of pre-recorded programming. The original Beta units used a faster speed that could only record up to 1 1/2 hours (on an L-750 cassette). This is the speed used in the industrial units; none of the home units will record it, but some will play it back. We feel the Beta tape handling system is easier on tape in search and fast/slow play modes and the Beta industrial units put it to good use.

On the home front, Sony's SL-2000 Betapack may do for video what their Walkman did for audio. It is small, light, and fully featured. With a wireless control you may find it easy to interface. A built-in tape timer is electronic, so there are points within the deck where you can link up to the frame counter. More sophisticated are the industrial SLP and SLO players and records. The SLO-383 is Beta's king of the hill. Using the same interfacing as the more expensive U-Matic machines, it can be hooked up to edit controllers and frame search devices. All the frame count pulses are on a rear panel jack.

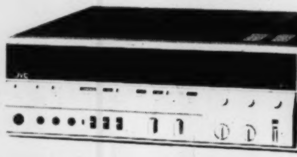
1/2" VHS Systems

Like its 1/2" brother, VHS is available in both home and industrial strength. Here, however, there is one speed (the two hour SP mode) that is common to all machines. All pre-recorded programming is currently in this speed, and the more sophisticated industrial VHS machines can use it, whereas the industrial Beta decks cannot playback consumer cassettes.

Home VHS machines have about the same attributes as Betas, great for entertainment use, but not easily interfacable and limited in ability to be converted to frame search. Because of rougher tape handling than Beta, it is probably best to stick with machines from JVC and Panasonic intended for heavy duty use.

JVC's new BP-5300U player and BP-6400U recorder fit the bill nicely for computer use. They have rear panel jacks with frame count outputs, good tape handling and precise capstan servo drive. JVC recently introduced edit interfaces along with wired, wireless and search remotes. This first JVC industrial VHS (they invented the format) should be a winner.

Panasonic also has some industrial VHS machines worthy of attention: the NV-8170 player and NV-8200 recorder. While they are a bit older in design than the JVCs mentioned above, they share most of the features that make them popular for computer interface, and they have stood the test of time as well as hard use in school and office environments.



JVC BR-6400U.

Other Videocassette Formats

As we said, there are video formats for everyone, and there are a few more that you should know about, either to consider for use or to avoid for computer driven applications.

The CVC format uses 1/4" tape cassettes in machines made by Japan's Funia and sold here by Technicolor and Canon. While this format has great virtue as a lightweight (7 lb.) portable, its quality falls a bit short for multi-set distribution applications. Also, the lack of interfaces in what is strictly a portable machine makes this something you may want to use to replace your 8mm camera, but it won't marry well to a computer.

The Video 2000 on the other hand, has distinct possibilities. Originated by Germany's Grundig and in use throughout Europe, it is planned for U.S. introduction in early 1982. Up to four hours can be recorded on each side of 1/2" cassettes, and the system has a still, fast play, and slow play quality that far surpasses any of the 1/2" machines now available. Even more important is a built-in search function to allow you to access any frame on the cassette in under two minutes—the fastest of any VCR.

There is no software in the American NTSC video format yet for this machine, so it is definitely a "roll your own" proposition. We'd be hesitant about being the first to buy a machine without a well established dealer and service network, but the technical specs on the Video 2000 may make it very desirable for computer use in the future. If you can wait a while to see how committed Grundig will be to marketing it in the U.S., you may have an interesting possibility here. If nothing else, you will almost certainly be the only one on your block to have one.

As we said, the choice of video equipment to use with a computer is dizzying. Perhaps you now have a little more information with which to arm yourself when shopping around. If we can leave you with nothing else let it be this: Don't be so blinded by the capabilities, price or format of a machine that you lose sight of what you really need for your application.

It is nice to buy equipment that has room to grow but beware: in video the bells and whistles don't come cheaply. By the time you need the capabilities for which you've paid dearly, you might well be able to buy a new machine that does all you now need and more for less. (Video equipment cycles seem to run their course about every three years for consumer gear; about every four for industrial units.)

No matter what you choose you will certainly find that video will add a new dimension to computing.

The names and addresses of the manufacturers mentioned in this article are listed below.

Thomson-CSF Broadcast, Inc.
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Panasonic Company
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JVC Corporation
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	DT80/3 CRT Terminal	1,295	125	70	48
	DT80/5L APL 15" CRT	2,295	220	122	83
LEAR SIEGLER	ADM3A CRT Terminal	875	84	47	32
	ADM31CRT Terminal	1,450	139	78	53
	ADM42 CRT Terminal	2,195	211	117	79
HAZELTINE	1420 CRT Terminal	945	91	51	34
	1500 CRT Terminal	1,095	105	58	40
	1552 CRT Terminal	1,295	125	70	48
TELEVIDEO	920 CRT Terminal	895	86	48	32
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CIRCLE 301 ON READER SERVICE CARD

Household control through the magic of electronics

BSR System X-10

David H. Ahl

IMPORTANT: SET HOUSE CODE DIALS ON ALL OTHER UNITS TO SAME LETTER AS DIAL ON BOTTOM OF THIS UNIT.
COMMAND CONSOLE

It was with a great sense of anticipation that I brought my newly-acquired BSR System X-10 home. Now finally through the magic of electronics I would be able to overcome all kinds of niggly little problems around the house. For example, when coming home after dark, from the side door I would be able to turn on a light to illuminate the stairs so I wouldn't inevitably trip over the bottom step. Or when I was away at a trade show my lights would come on automatically and indicate to prospective burglars that perhaps someone was at home. Or when going to bed at night I would be able to turn on the bedroom light then turn off the living room light without having to grope my way down the hall in the dark again, inevitably tripping over some piece of debris. Or, from the comfort of the living room I would be able to turn on the attic exhaust fan without having to go to the bedroom closet in which the high/low toggle switch for the fan is located.

Unfortunately, upon getting it home and reading the instructions, I found that the System X-10 would solve none of these problems. In fact, it seemed singularly useless. (Lest you stop reading here, let me hint that things get better). The BSR System X-10 comes in many configurations. I had purchased the "Ultrasonic Controller Starter Kit." This consists of an ultrasonic command console, ultrasonic cordless controller, two lamp modules, and one appliance module. The black and simulated wood grain command console measures about 4" x 3" x 2" and is designed to be placed in some central location. Flipping the top up, one finds sixteen buttons which can control up to sixteen electrical devices in the house. Each device may be turned on or off individually, lights may be brightened or dimmed individually and all lights may be turned on or off from the central command console. The central console needs no attachment other than to plug in to a wall outlet.

Each of the lamp modules and appliance modules also plugs in to a wall outlet. On the sides of the units are rotary switch wheels which select the device code. For example, code 12 may be a bedroom lamp and code 7 a game room air conditioner. The command console comes with a sheet of peelable labels which have the names of nearly every appliance found in the home printed on them. These can be put on the box lid to indicate which device is to be controlled by which switch.

The appliance module works similarly to the lamp module, i.e., it is plugged in and the respective appliance (air conditioner, fan, hi-fi, television, etc.) is plugged in to the module. The instructions admonish the user never to plug a fluorescent light into a lamp module; rather it must be plugged into an appliance module.

The last device in the box, the ultrasonic cordless controller, allows you to sit across the room from the command console, aim your cordless controller at it, press the right sequence of buttons and control your devices without even getting out of your easy chair. You don't have to have particularly sharp aim to get the device to work, on the other hand it will absolutely not work from another room or location in the house.

So basically, what we have is a system that lets you sit in one room in the house and turn on and off devices in other rooms. Look at the four applications I had in mind at the beginning of this article. Can you see why none of them is possible with the basic system? The problem in two cases is that control is from one point, whereas I needed control at two points. In another case, I required a timer, while in a third case I was trying to control a "hard wired" device (the attic fan) which did not have a normal plug.

Ultrasonic Controller
X-10

Components of the Ultrasonic Controller starter kit.

The solution for the first problem is not easy to solve, short of getting several additional command consoles to put at each point where I wanted control. This unit just does not have any way of turning things on and off from more than the central location. There may be applications where a second command console is justified, however, I reasoned that mine was not one of them.

The timer problem was easier to overcome. BSR also makes a timer for the X-10 unit. Unlike other mechanical or electronic timers on the market, the BSR timer allows one to turn on and off any of the up to eight devices controlled by the system. This is a real plus and, indeed it went a good part of the way toward solving some of the other problems. For example, turning on the inside lights ten or fifteen minutes before I normally get home solved the problem of tripping up the stairs. Once home, I can easily turn these lights off from either the central controller or the light itself. You might argue that this is a waste of electricity, however, we are talking about 40 hours of a 50-watt bulb per year which, in this area, works out to about 12 cents. And if you are willing to spend $50 or $60 on an electronic control system, 12 cents for electricity shouldn't be of much concern.

The timer, incidentally, can be used with or without the command console. The way it works is that it displays a digital clock and you simply program each device to turn on or off at the one or two times a day that you wish. When used as a device to control lights for security, you can use the variable feature which turns a light on or off within a 32-minute preset period. The programmable timer also has a "sleep" command which turns off lights and appliances one hour after the key is pressed. This device, in my mind, is by far the most useful in the system as it has

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BSR X-10, continued...

the ability to replace everything from clock radios to security timers as well as offering central control.

But back to central control. What about my fan? Here I wanted to control a remote device from a central location, something that the System X-10 is supposed to be able to do. In this case the solution was relatively simple: buy a wall switch module. This comes in two flavors: one that simply turns lights on and off, and one for controlling two-way lights (say a hall light that can be turned on and off from two separate switches). One has to get used to the three way switches; they're push button, with a small lock-in/lock-out tab at the bottom of one of them.

All told, I have about $200 worth of controllers and modules in my BSR System X-10. I could have done it for about $130 which would have excluded the manual console and ultrasonic controller which I rarely use. On the other hand, I have found the system growing on me. I have far more lights, appliances and electrical devices in my home plugged into it than I had anticipated. Originally I thought the living room, the central room in the house, would be the place to locate the command console. However, I have found from experience that the bedroom offers me much more flexibility. I can go to bed at night secure in the knowledge that I have turned off every electrical device in the house. Even the hi-fi, which has only one small LED to indicate that it has been left on. Also, in the morning I can turn on a bathroom heater or coffee maker while still in bed. Most clock radios are of questionable quality, mine was no exception. I now have it in a guest bedroom and use a decent receiver in my bedroom controlled by the programmable command console.

In summary, I had some moderate expectations for the BSR System X-10. I brought the unit home and was bitterly disappointed. Now, some months later I find that it has not only met, but exceeded my expectations by a fair margin. If I were working for * beep * magazine, I would rank the unit "a best buy."

Postlude: computer fanciers will be happy to know that the ultrasonic controller unit interfaces reasonably easily to the Apple and other computers. This, in fact, is the reason that I got it in the first place. However, I found that the unit with the programmable timer does everything that I wished to do, so I did not take the next step of interfacing it to a computer. For those that do wish to take this step, see the extensive discussion in *Creative Computing*, November and December 1979 issues.

The BSR System X-10 is manufactured by BSR (USA) Limited, X-10 Products, Route 303, Blauvelt, NY 10913. □

attention: programmers!

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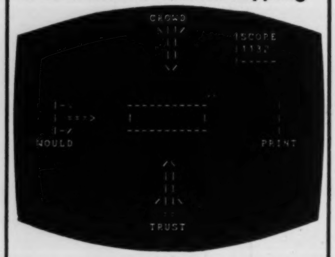

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CIRCLE 223 ON READER SERVICE CARD

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Night Sentry

David H. Ahl

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CLEAN
ON

You've got a problem. When you go away, you'd like lights in the house, or outside, to turn on and off. But you've just thrown away your third mechanical timer in less than two years. You know, those little $8 or $10 devices with a clock face which plugs into a wall outlet and into which the light plugs.

That was my problem. The first two timers just quit working and that was that. But the third one developed the annoying habit of turning a light "almost" on. When it did so, the TV set flickered, the light flickered, and a strange little crackle came from the timer. So I decided to take it apart. I still had the first two timers and I decided to take them apart too. In all cases, I found the same problem: pitted contacts. I was in the pits and $25 was down the tubes.

At this point I saw a JS&A ad for the Night Sentry. What did I have to lose? Another $25? Why not?

What is it? Night Sentry is a timed light control that replaces a wall switch. It can control one or more lights totalling 40 to 500 watts. Like other devices of its type, it cannot control fluorescent lights, mercury vapor lights, appliances, radios, etc. I have it hooked up to two 150-watt flood lights and it has been in operation for over nine months with no signs of deterioration, dimming, or TV interference.

Installing it is simple. It fits in a standard switch box and uses the existing plate. In my case, I happened to have a round switch, of the type so popular in contemporary houses built 15-20 years ago. However, I still had no trouble except I had to drill a small hole in the switch plate to accommodate the indicator light tube which shows that the device is functioning. With a standard switch plate, no drilling is necessary. Night Sentry comes in two versions: one for single switches, and a second to replace two-way switches.

Once installed, Night Sentry must be programmed. This may be done in one of two ways. The first and perhaps simplest, way is called "24-Hour Self-Programming." In this method of programming, the outer dial of the switch is simply set to the current time of day and for the next 24 hours you turn the lights controlled by night sentry on and off in their usual way. Night Sentry acts as a normal switch when you press the central area. After 24 hours, the programming is complete and, from then on, Night Sentry will turn lights on and off in exactly the same way as you did during the first 24 hours.

Rapid Programming is done similarly; one rotates the outer clock dial of Night Sentry turning lights on and off at the appropriate times. After the dial has been rotated through 24 hours the red indicator light will come on, indicating that the Night Sentry is fully programmed and in automatic operation. Unlike other manual and mechanical timers that permit one or two on/off cycles within a 24 hour period, Night Sentry permits up to 24 on and 24 off periods. Since it is intended to be used as a security device the on and off times are programmed to vary at least seven minutes from the times set and at least fifteen minutes from the previous day.

Night Sentry has three other neat features. First, during a short-duration power failure Night Sentry will retain its programming for at least five minutes and resume operation. Second, after a longer power failure Night Sentry will not resume operation with the wrong times, thus giving a burglar a sure indication that your premises are unoccupied. Rather, Night Sentry keeps all lights off after a prolonged power failure. Third, the red indicator light in Night Sentry will go off in the event that the light being controlled has a burned out bulb.

In operation, Night Sentry draws less than 1 watt, thus, literally costing pennies a week to operate. Suggested retail price is $29.95, although in this area we have seen it available at a discount from that price. Night Sentry is made by Dynascan Corporation, 6460 West Cortland St., Chicago, IL 60635. ☐

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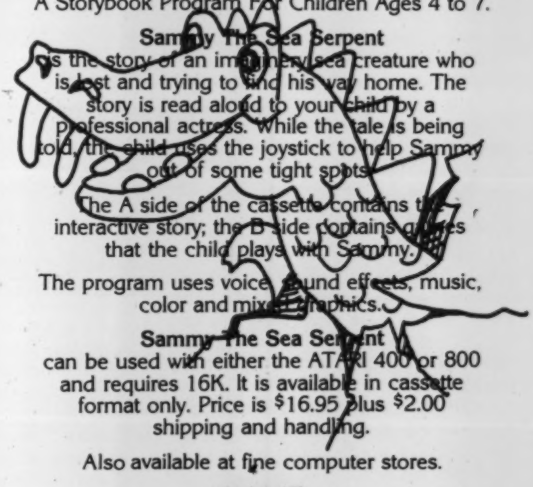

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CIRCLE 297 ON READER SERVICE CARD

One Moment Please...

Milton Gussow

With the coming of age of the microprocessor, even the plain old telephone is experiencing a transformation. At stake is a diversified multi-billion dollar carrot. With complete deregulation of the telephone equipment industry due in 1982, every business, institution and home is a potential customer. The industry anticipates that it will sell 2.5 to 3 million telephones to private individuals in 1981. And that is only the tip of the iceberg. Electronic enhancements, via the microprocessor, will add millions more units to this potential.

Topping the growing stack of personal telephones and accessories are the cordless instruments, selling at from $100 to $650. These operate via a radio signal with a base station to provide almost as many functions as a stationary unit, but from distances up to hundreds of feet. The latest models allow the user to talk and to listen without pressing any keys or buttons. Models include such features as automatic dialing of pre-programmed telephone numbers, and re-dial of the last number dialed. Batteries are recharged in the base station cradle. According to industry projections, upwards of 800,000 cordless telephones will be sold in 1981.

Electronic telephones also breed accessories. An electronic line selector on one unit allows a cordless telephone to be used with a key set. The unit allows the attendant to place a call on hold. When the cordless telephone goes "off-hook," the unit automatically releases the line from hold. A privacy feature prevents accidental interruption.

Another important microprocessor-controlled telephone accessory is the answering machine, some of which are combined with electronic telephone instruments. Although automatic answerers with remote access have been available for several years, new microprocessor developments including voice recognition have improved security for recorded calls. This also eliminates a need for a special tone signal device to actuate a remote unit. Another unit does away with audio recording. Instead, it records digitally the telephone numbers of up to 10 different callers and displays these sequentially at the press of a button.

A third group of microprocessor-controlled accessories includes the automatic dialers, some of which are offered as part of an electronic telephone. One of the most unusual mini models replaces the microphone cap of an ordinary telephone. One version stores up to 80 different 8-digit local numbers on each memory (for long distance two memories are strung together). An experimental unit shown at the Summer Consumer Electronics Show uses voice recognition to dial any of several voiced commands, such as a person's name, "doctor," "fire," or "wife." And talk about microprocessor tenacity, one automatic dialer that works through the telephone automatically dials and automatically redials up to 176 pre-programmed numbers.

Along with conventional uses for telephone equipment, microprocessors are appearing in sophisticated electronic countermeasure devices to detect phone taps, radio frequency "bugs," and hidden wires. One sensitive portable radio frequency detector even warns the user of a tape recorder or bugging device in operation nearby. A voice stress analyzer provides "instant verification of verbal information" according to the manufacturer.

Cordless Telephones

The ITT Cordless Phone System features "Call-on-Hold Intercom," a security feature, memory re-dial, high-low volume switch and automatic battery recharging. The call-on-hold feature allows an attendant at the base station to put an incoming call on hold, page the portable phone, and

Milton Gussow, 1904 Columbia Bay Drive, Lake Villa, IL 60046.

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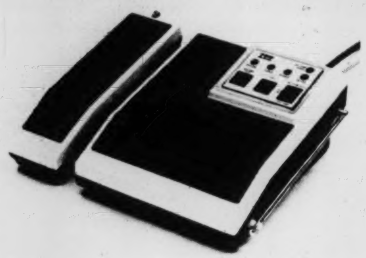
talk without the caller being able to hear the conversation. Tel-Pulse dialing operates on tone and pulse lines, and a memory re-dial button automatically repeats the last number called. The Base station has a security feature which blocks outgoing calls if the portable unit is in the charging cradle.



ITT Personal Communications, 133 Terminal Ave., Clark, NJ 07066. (201) 381-2828.

Two cordless extension telephones, the Muraphone MP 600 in modern design and the MP 700 in conventional look, offer an FM range up to 600 feet. Both operate 12 to 15 hours on rechargeable batteries and include a low battery light. Accessories from Mura permit automatic call switching and connection to a key system. The base station plugs in with no tools required. Retail price of the phone is $180.

CORDLESS
EXTENSION
TELEPHONE

Mura Corporation, 177 Cantiague Rock Rd., Westbury, NY 11590. (516) 935-3640.

The "hang up anywhere" cordless telephone Model TEL-2500 Talkabout from Universal Security Instruments has an automatic function switch that hangs up when the portable unit is placed face down on any flat surface. In this ready mode, the handset rings when a new call comes in. Its range is 100 feet, with a built-in privacy switch to disable the microphone when speaking privately to others nearby. The Talkabout offers full duplex operation for two-way conversations without switching. A phone-in-use indicator in the base unit lights up if another portable on the same number is in use. The unit is compatible with any pushbutton or rotary dial system. Built-in rechargeable batteries in the handset, which has no dial, recharge when it is in the base unit. Talkabout retails for $130. Universal Security Instruments, Inc., 10324 S. Dolfield Rd., Owings Mills, MD 21117. (301) 363-6000.

The Webcor Zip Model 575 attaches to a rotary or touch tone dialing system through any modular phone jack. It has a range of up to 700 feet and features automatic re-dial of the last number dialed, and intercom between the portable unit and base with a signal button. It recharges automatically when in the base, and has an in-use indicator and belt clip for the remote unit. The modular jack in the base also accepts a telephone answer machine or another phone. The sugested retail price is $240. The Model 555 with a range of 400 feet includes similar features and lists at $230. The Model 525 with a 500 foot range is priced at $130. Both have intercom signals.

Leisurecraft Products Ltd., 28 South Terminal Dr., Plainview, NY 11803. (516) 349-0600.

Answering Machines

The Code-A-Phone message center with a push button (pulse) dial telephone is compatible with any phone line. It features a lighted call counter that flashes when calls have been received, and indicates which message is playing. It also has controls for selective erase, fast rewind and forward.

A pocket coder will trigger the Model 1550 from any telephone in the world, with the option of rewinding to restore full message capacity or saving messages for later reference. A speaker is included for call monitoring, and the ring delay feature enables calls to be answered when convenient, even if the machine is in answer mode; or they can be recorded and returned later. A two to twenty second outgoing announcement tape is recorded via the handset, and the announcement tape rewinds instantly for immediate replay. Retail price is $340. The Model 1750 at $300 provides a full 30 minutes of voice actuated messages, with the option of limiting calls to 45-seconds.

Ford Industries, P.O. Box 5656, Portland, OR 97228. (503) 655-8940.

ITT also offers two telephone answering machines, the Easy Answer and the Perfect Answer 2. The moderately priced Easy Answer uses a dual tone beeper for remote access, while the more sophisticated Perfect Answer is activated by voice. Easy Answer has a non-remote model priced at $140; others to $450. Easy Answer includes phone jack, fast erase button, announcement only switch, ringer adjust, and tape counter as well as remote backspace to replay message

The Perfect Answer 2 includes a built-in pushbutton telephone, an LED diagnostic control center which is a call counter, an announcement timer and a function alert. Both incoming and outgoing mesages are voice activated for variable length. All units feature dual cassettes, built-in microphone and speaker for monitoring incoming calls.

ITT Personal Communications, 133 Terminal Ave., Clark, NJ 07066 (201) 381-2828.

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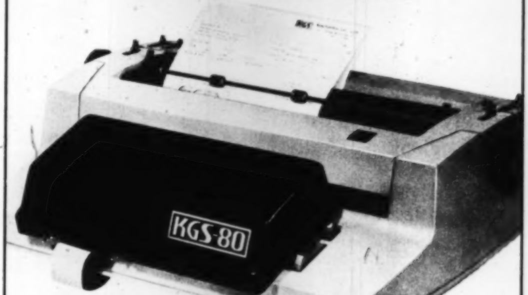

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CIRCLE 305 ON READER SERVICE CARD

you. A call made to the device receives a distinctive tone (adjustable delay up to 30 seconds). The caller then dials his own number, waits for the tone to be repeated, then hangs up. On returning, the owner can immediately display on an LED, in sequence, all numbers (up to ten) that have been recorded. Obviously, the calling party must understand the system to make it work. Suggested list is $130.

Feedback Inc., Logatel Div., Box 143, Gillette, NJ 07933. (201) 264-2841.

Automatic Dialers

The Demon Dialer is an understated name for this automatic dialer that persists to reach unanswered telephones, busy numbers or a list of up to 93 different numbers. When trying to reach a busy number, the Demon Dialer 93T silently re-dials the call 10 times the first minute, and once every two minutes for up to two hours after that, until the number answers. And your telephone stays open to receive calls when it's working.

Need to get through to someone who is not at home? The Demon will dial the number every ten minutes for up to ten hours and signal you when someone answers.

A memory of 93 numbers is accessed by either code letters such as "TWA," or a two-digit number. The automatic dialer, plugged into any phone line, gives all telephones on that line automatic dialing capabilties. The Model 93 is a pulse dial for $150, while the 93T is a faster tone dialer at $180. Models 176 and 176T (for tone) store up to 176 numbers at $200 and $230 respectively.

Zoom Telephonics, 122 Bowdoin St., Boston, MA 02108. (617) 523-6281.

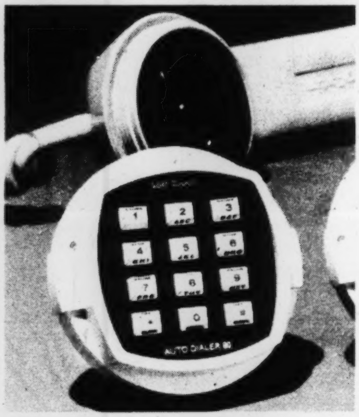
The Phone Controller stores up to 30 different 16-digit numbers, has a built-in speaker and a quartz digital clock on a large LED display. Built-in functions include automatic re-dial of up to 14 tries at one-minute intervals until the called party answers. On all calls, the unit disconnects after six rings on an unanswered telephone but includes a manual override. Pauses can be programmed into any number for use with dial access codes. A hold control is also featured, and the clock serves as an elapsed time indicator for timing calls. Dial output is selectable, so the controller may be used with either rotary or touch tone dial. Model PC-30 is $100, and includes its own keypad for pushbutton dialing on rotary telephones.

The Just-A-Dialer, without a keypad, has 15 stored memories, and retails for $50. Units connect to key telephone sets and can be selected for any of up to five lines on older systems, and for any line on newer systems, by use of the Universal 100 multi-line sandwich Amphenol adapter at $35.

Just-A-Dialer

Dictograph Corp., 89 Glen Cameron Rd., Thornhill, Ontario L3T 1N8, Canada. (416) 881-0074.

The Soft-Touch Autodialer is a compact automatic dialer that replaces the mouthpiece cap of most telephones with pushbuttons. The Soft-Touch stores 20, 40 or 80 eight-digit local numbers, or strings long distance numbers of up to 16 digits in two memory locations. In addition Buscom Systems offers three shirt pocket models, which fit acoustically on the mouthpiece for accessing special carriers or numbers when away from the office. One has no memory, one has 20, and the other has 80 positions. Prices range from $45 to $150.



Buscom Systems, Inc., 4700 Patrick Henry Dr., Santa Clara, CA 95050. (408) 988-5200.

R.R. Transmitter and Recorder Detector

Security Research International offers a countermeasures device to detect the presence of R.F. Transmitters and tape recorders. The Model TRD-800 is small, lightweight, and compact. It can be carried or concealed almost anywhere. The dual mode wristwand provides increased sensitivity by allowing extended mobility and directional examination of the environment. Primary alert is by a silent miniature vibrator and a visual display. Custom fabrication will install the unit in almost any item from lamps to barometers. Price is $1,550.

Voice Stress Monitor

Assuming that the presence of stress in a person's voice calls into question the validity of what he is saying, the Model ESM-4000 Voice Stress Monitor enables the average person to have instant verification of verbal information. The monitor operates by responding to involuntary voice "micro-tremor activity." The method has been proven a very reliable indicator of emotional stress. This modulation is associated with voice harmonics rather than fundamental frequency of the voice, and is therefore detectable over the telephone or other voice grade sources. The unit comes with batteries and a self-contained microphone, AC charger, telephone induction coil, connection cords, specially modified miniature tape recorder and cassette calibration tape, textbook and cassette training tapes. Price is $2,250.

Hidden Wire Locator

The Model AN6-150 from Security Research International is an acoustic noise generator, transducer, inductor and hidden wire locator, which generates broadband audio noise on an object—typically a window or wall—that may be subjected to eavesdropping by spike microphones, hidden microphones, or microphones with extender tubes. Is also effective for the disruption of eavesdropping in the form of microwave and laser reflection. Since these techniques require that the laser or microwave signal be reflected or bounced from a fairly stable surface—usually a window—the unit defeats these techniques by producing unfilterable noise that masks the entire human voice range by saturating the surface with various vibrations. The unit utilizes transducer and telephone induction devices to counter other eavesdropping modes.

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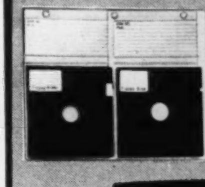

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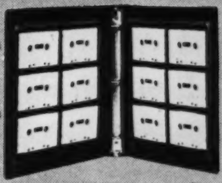

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Electronic Music in Small Packages

Stephen B. Gray

It seems only natural for a company that makes calculators and digital watches, to turn to musical instruments based on digital circuits. Casio Inc. has several keyboard instruments designed around microprocessor chips.

The Casiotone M-10 Electronic Musical Instrument is only 16 1/2" wide, but this well-built 3 1/2-pound instrument surpasses many larger instruments in the realistic quality of the sound it produces.

The keyboard consists of two and a half octaves of keys that are only 3 1/4" long, and narrower than average-size organ keys, with seven of the white M-10 keys taking the space of about six standard organ keys. Which means the instrument is somewhat difficult to play if you're used to a standard keyboard. But with a little practice, you can play fairly well, as long as you don't try things like fast arpeggios right away.

The sound is much better than you might expect. This instrument has four voices: piano, violin, flute, and organ. When the slider at the right rear of the keyboard is set at *piano*, you get tones that die away, just as piano sounds do.

Although the piano sound is a little too electronic to fool anybody into thinking the sound is from a real piano with strings, the other three voices are good enough to fool many people into thinking the M-10 is a much bigger instrument than it really is. The violin and flute tones are full-bodied and the organ sounds are surprisingly rich for such a small instrument.

Casio's M-10 keyboard instrument can reproduce the tones of a piano, organ, flute and violin. Up to eight notes can be played simultaneously on its two and one half octaves, and it's small enough to fit into a briefcase.

There are only three other controls: a vibrato that adds a great deal to all four voices, a volume control, and an on/off switch.

One feature that helps make this instrument such a marvel is that up to eight keys can be played simultaneously, so that the M-10 can sound more like a full electronic organ than just about any other instrument anywhere near its size you've ever heard.

The speaker is small, apparently only one by three inches, yet it is surprisingly effective for its size.

All in all, the Casio M-10 is well worth the $149.50 it costs, if you're interested in creating the best electronic sounds in the smallest space, (Macy's in New York had it on sale at $135 late last year).

The keyboard is big enough so that, with a little fudging now and then, such as dropping some of the lower notes, you can play some quite respectable-sounding music with both hands. Not the big "Toccata and Fugue" of course, but quite a few other, less grand, pieces.

With the flute voice, vibrato off, and staccato playing, you've got a nice little calliope sound, right out of a circus parade.

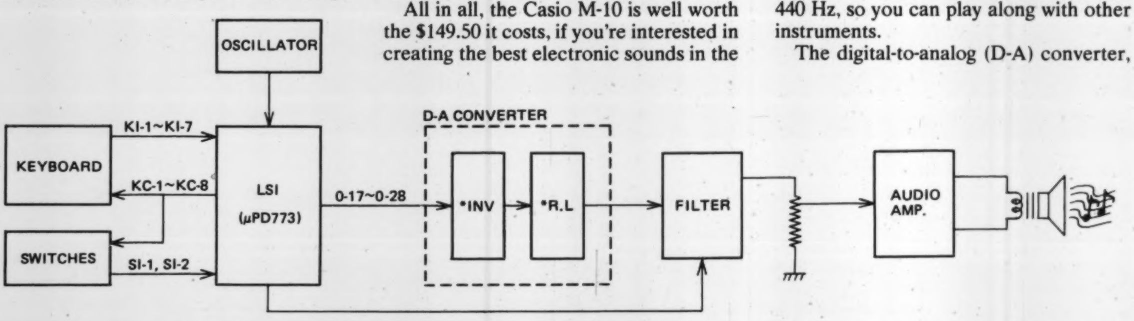
M-10 Block Diagram

The block diagram shows a crystal oscillator, which generates the top frequency of 4.536688 MHz.

The LSI circuit, which is a D773G microprocessor, converts the keyboard signal to a 12-bit digital signal. The keyboard signal comes from a matrix whose inputs are seven signals generated in the LSI and applied to the keyboard, and six inputs that depend on which key is pressed. Out of the total 42 possible combinations, the M-10 uses 32, which is two and a half octaves, from F to C.

The four different voices—violin, flute, piano, organ—are generated in the LSI chip. The frequency of the middle A is 440 Hz, so you can play along with other instruments.

The digital-to-analog (D-A) converter,



The block diagram of the Casiotone M-10 includes the LSI circuit, a Japanese D773 microprocessor, which replaces most of the wiring and discrete components that would double the cost of the instrument.

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Space Games-I

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TIME 83 MISSILES 15 SCORE 0

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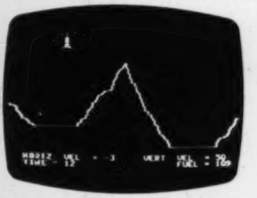

Rocket Pilot. Maneuver your spaceship over the mountain using horizontal and vertical thrusters.

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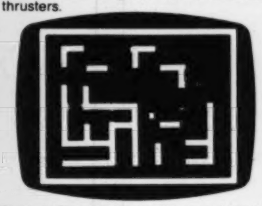
MAY THE FORCE BE WITH YOU

Star Wars. Shoot down as many TIE fighters as possible in 90 seconds.



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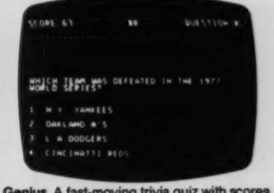
ANDROID NIM
16 ANDROID NIM'S TURN

Skunk. A 2-player strategy game played with dice, skill and luck.



SCORE 63 $0 QUESTION 6

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2 OAKLAND A'S
3 L A DODGERS
4 CINCINATTI REDS

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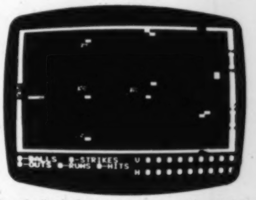
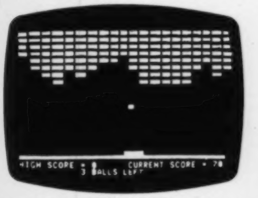


Baseball; A 2-player game with pitching, batting, fielding, stealing and double plays.



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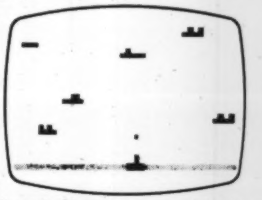
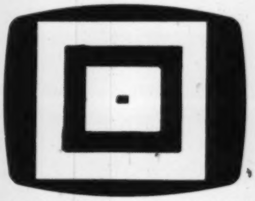


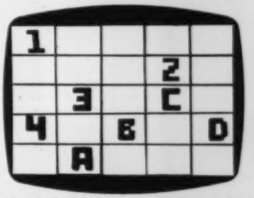
Torpedo Alley. Sink as many warships as possible in 2 minutes.



Darts. Use game paddles to control the throw of 6 darts.

Brain Games

Cassette CS-4004 $11.95 7 programs Requires 16K Apple II or Apple II Plus



Dodgem. Be the first to move all your pieces across the board in this intriguing strategy game.

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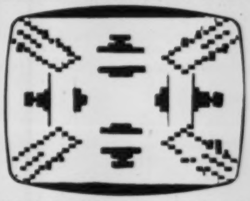
1
2
3
4
5
6
GREEN'S MOVE (HOP VERT) TIME=14

Nuclear Reaction. A game of skill, fast decisions and quick reversals of position.

R T Y
F G H
V B N
YOUR TURN

Parrot. A Simon-type game with letters and tones. **Dueling digits** is a version with numbers.



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which consists of inverters (INV) and a resistive ladder network (R.L), converts the 12-bit digital signal into an analog output.

The filter block passes a certain range of frequencies according to the selected tone, and provides a cutoff frequency of 750 Hz for the piano and flute tones, 820 Hz for the violin and organ tones.

The audio amplifier simply amplifies the sound to a level high enough to drive the small loudspeaker.

The Casio M-10 has jacks for headphones and an AC adapter. Ordinarily it runs on several C batteries.

Casiotone 201

If you're really into electronic keyboard instruments, you might be more interested in the Casiotone 201, which has four full octaves, is twice as wide, weighs 15 lbs., and is also eight-note polyphonic.

Each of the 29 white keys, when pressed in SET mode, selects a different tone, including violin, clarinet, flute, cello, trumpet, organ, pipe organ, harpsichord, glockenspiel, flugelhorn, ukulele, harp, banjo, electronic piano, and koto (Japanese zither).

You can set up to four tones to be controlled by a tone-memory selector, for changing preset tones quickly while playing. The other controls at the right end of the keyboard are the PLAY/SET, vibrato, volume and on/off switches.

The Casiotone 201, which has a suggested retail price of $599, operates on AC only. Options include a volume-control pedal, sustain pedal, stand, and both hard and soft cases. Rear-panel jacks are provided for attaching echo devices, equalizers, rhythm boxes and pedal boards, and for outputting to an audio system.

The Casiotone 201 is a more sophisticated keyboard instrument, with four octaves, 29 voices, and a variety of options including volume-control and sustain pedals, a stand, and carrying case.

Other Casiotones

Several other Casiotone instruments are available. The MT-30, with 37 keys and 22 instrument sounds, was recently sold by Macy's in New York for $175.

The Casio 401, with 49 keys, 12 instrument sounds, two synthesizer sound effects, 16 built-in rhythms from rock to rhumba, in one-finger chords, was $700 at Macy's.

The latest (and least expensive) model, at this writing, is the VL-tone, which closes the Casio circle by combining a keyboard music-maker with a calculator.

Available in New York for as little as $59 this summer, the VL-Tone has over two octaves (29 very short keys), ten automatic rhythms (bossanova, march, rock, etc.), and five voices (piano, organ, violin, flute, guitar).

You can record up to 100 notes in the VL-Tone's memory and then play them back, speeding up the melody or slowing it down. The built-in calculator is operated by the white keys, when the VL-Tone is in calculator mode. ☐

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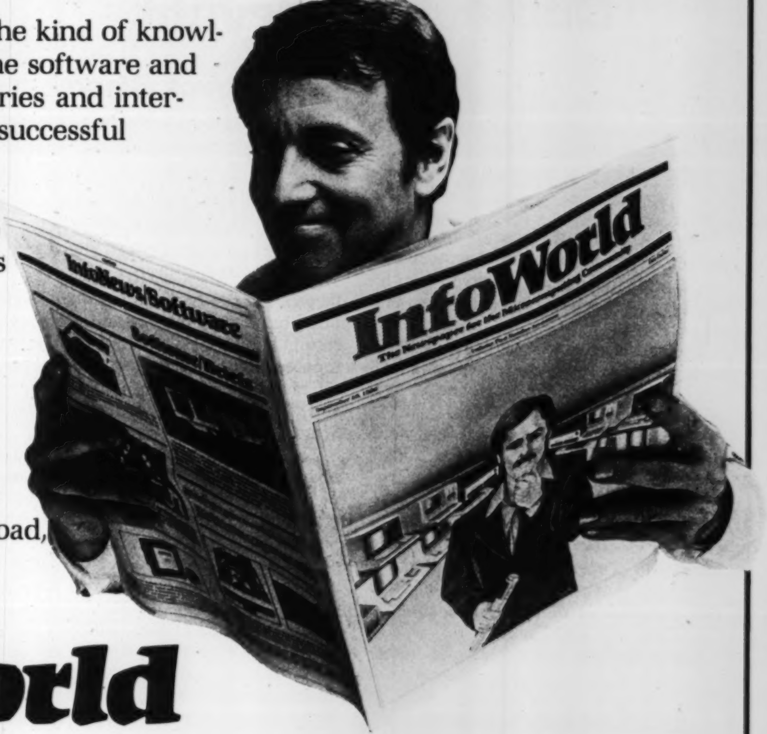

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The Microprocessor as Domestic Servant

Jack Blood

Microprocessors, the stuff of which personal computers, electronic games and space programs are made, have recently begun to show up in kitchens across the country.

The appliance which comes immediately to mind when most consumers think of microprocessors in the kitchen is the programmable microwave oven.

Over 3.5 million microwave ovens were sold last year; most of them were "touch control" models which included microprocessor circuitry. Sales leaders in the market are U.S. firms Litton, Amana, General Electric (with Hotpoint), Magic Chef and Tappan; and the Japanese importers Sanyo, Sharp, Toshiba and the two subsidiaries of Matsushita Electric Co., Panasonic and Quasar.

Some of these companies also manufacture the products that are sold under other brand names. Amana, for example, supplies White-Westinghouse; Tappan supplies Sunbeam and Montgomery Ward; GE makes the JC Penney units; and Sanyo and Litton are principal suppliers to Sears.

The programmable models, available both in countertop units and in combination with gas or electric ranges, may be programmed to defrost, cook and keep warm. Some even offer pre-programmed "recipe" cards which eliminate the need to calculate and key in the proper duration for each cycle.

A recent innovation combines a microwave and a convection oven in the same unit, thus allowing the cook to take advantage of the complementary cooking features offered by two different technologies.

The Tappan 77-4981 Cooking Center combines microwave and conventional ovens with a smooth ceramic cooktop.

The Panasonic Talking Genius features a voice synthesizer which repeats instructions.

The Litton 776 single oven microwave range combines microwave and conventional cooking.

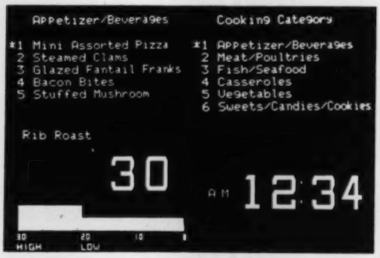
Seven of the 12 microwave ovens and ranges in the Litton consumer line include microprocessors. In the single cavity Model 776, which combines microwave and conventional cooking in one unit, several functions, such as self-clean and automatic oven controls, are governed by a microprocessor.

Panasonic goes a step further with the Talking Genius, in which a voice synthesizer repeats the program steps and power levels as they are entered, thereby reducing the margin for error. Its sister Matsushita division, Quasar, has a similar talking unit.

One futuristic oven, exhibited by Matsushita at the Summer Consumer Electronics Show responds to oral instructions from the user. It also displays menus and program input on a 6" color monitor.

Other Appliances

Whirlpool has extended the use of microprocessors to include more appliances



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   Appetizer/Beverages            Cooking Category

*1 Mini Assorted Pizza         *1 Appetizer/Beverages
 2 Steamed Clams                2 Meat/Poultries
 3 Glazed Fantail Franks        3 Fish/Seafood
 4 Bacon Bites                  4 Casseroles
 5 Stuffed Mushroom             5 Vegetables
                                6 Sweets/Candies/Cookies

 Rib Roast

              30
                                AM 12:34

 30       20       10       0
 HIGH     LOW
```

The Matsushita Show-and-Talk microwave oven is voice-activated and has a built-in 6" CRT display and 20-digit thermal printer.

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The Sharp R-8310 combines microwave and convection cooking in a single unit.

than any other manufacturer. It employs them in a diagnostic program used by service technicians for troubleshooting repair problems, as well as in washers, dryers, dishwashers and refrigerators.

In the laundry room, microprocessor technology is used for programming the most used cycle—warm wash with cold rinse, for example—automatically. It also prevents the user from making an error in the selection of his own cycle on the touch controls. The machine will not allow him to select a "delicate" cycle and "hot" water temperature or any other combination which might damage clothes.

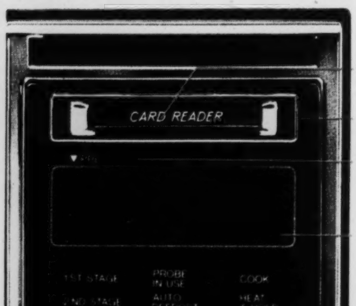
A top-of-the-line Whirlpool dishwasher uses microprocessor circuitry to provide a digital readout of the time remaining in a cycle, to delay the start of the cycle, and to diagnose problems.

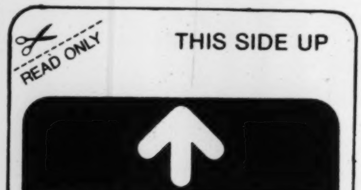
Whirlpool was also the first to employ microprocessor technology in a refrigerator. Here it is used to monitor conditions inside the appliance; lights come on when the door has been opened too many times—thus raising inside temperatures and threatening food spoilage—or when the condenser needs cleaning.

Microprocessor touch controls are also employed in the newest kitchen appliance, the magnetic induction glass top cooking surface. This product is so new there is little industry sales data to report. Entrants into this market include Chambers, a subsidiary of Rangair Corp.; GE; Dacor; Jenn-Air; Sanyo; Toshiba; Panasonic; and Roper. In most units, the touch sensors are used as on-off and power setting controls.

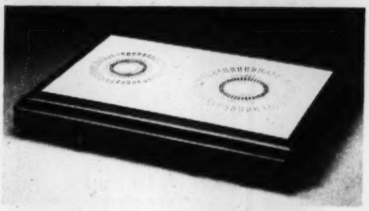
The following is a list of manufacturers of microprocessor-controlled major appliances:

Amana Refrigeration, Inc., Amana, IA 52203.





The Toshiba ER-899BT Brainwave features a card reader which accepts preprogrammed cooking "recipe" cards.



The IC W2000 Induction Cooking Plate from Sanyo features four electric eyes to ensure heating only when a pit is in place.

Caloric Corp., Topton, PA 19562.

Chambers Corp., Oxford, MS 38655.

Dacor, 950 S. Raymond Ave., Pasadena, CA 91105.

Frigidaire, 3555 S. Kettering Blvd., P.O. Box WC4900, Dayton, OH 45449.

General Electric Co. Major Appliance and Hotpoint Division, Appliance Park, Louisville, KY 40225.

Gibson Appliance Corp., Gibson Appliance Center, Greenville, MI 48838.

Hardwick Stove Co., Cleveland, TN 37311.

Hitachi Sales Corp. of America, 401 W. Artesia Blvd., Compton, CA 90220.

Jenn-Air Corp., 3030 Shadeland, Indianapolis, IN 46226.

Litton Microwave Cooking Products, P.O. Box 9461, Minneapolis, MN 55440.

Magic Chef Inc., Cleveland, TN 37311.

Modern Maid, P.O. Box 1111, Chattanooga, TN 37401.

Norelco, High Ridge Park, Stanford, CT 06904.

Panasonic, One Panasonic Way, Secaucus, NJ 07094.

Quasar, 9401 W. Grand Ave., Franklin Park, IL 60131.

Riccar America Co., 3184 Pullman St., Costa Mesa, CA 92626.

Roper Sales Corp. P.O. Box 867, Kankakee, IL 60901

Samsung Electronics, 2707 Butterfield Rd., Suite 270, Oak Brook, IL 60521.

Sanyo Electric Inc., 200 Riser Rd., Little Ferry, NJ 07643.

Sharp Electronics Corp., 10 Keystone Pl., Paramus, NJ 07652.

Sunbeam Appliance Co., 2001 S. York Rd., Oak Brook, IL 60052.

Tappan Co., Tappan Park, Mansfield, OH 44901.

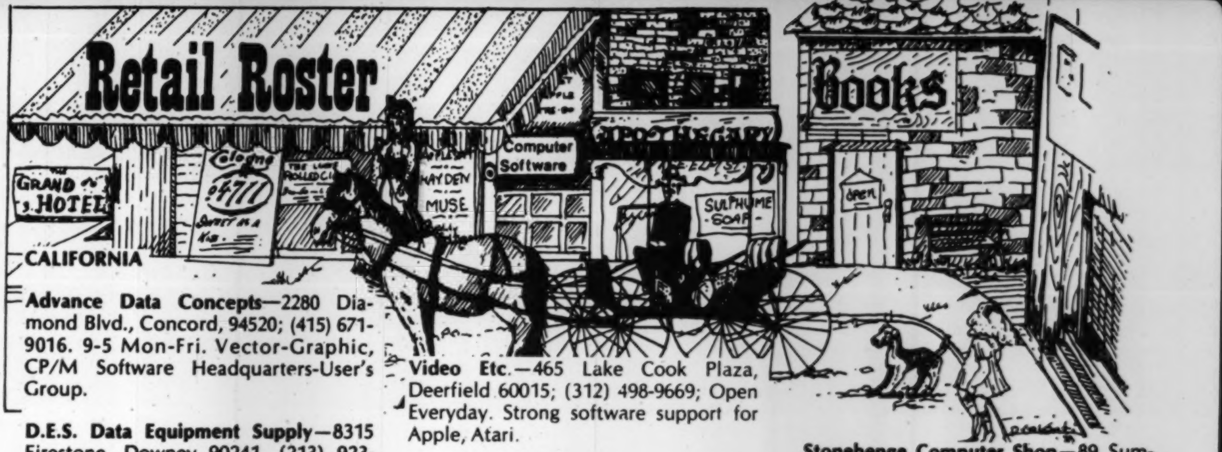
Thermador Division of Norris Industries, 5119 District Blvd., Los Angeles, CA 90040.

Toshiba America Inc., 19515 S. Vermont Ave., Torrance, CA 90502. (Along with six microwave ovens and a magnetic induction smoothtop, Toshiba also has a microprocessor controlled food processor and coffee maker-grinder.)

Whirlpool Corp., Administrative Center, Benton Harbor, MI 49022.

White-Westinghouse Appliance Co., 930 Ft. Duquesne Bvd., Pittsburgh, PA 15222.

□



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Upstate Computer Shop—629 French Rd., Campus Plaza, New Hartford 13413; (315) 733-9139; Mon—Fri 10—6, Sat 11—5. Apple—Commodore—Data General.

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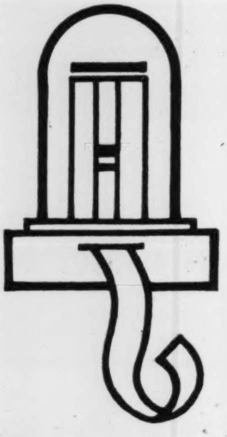

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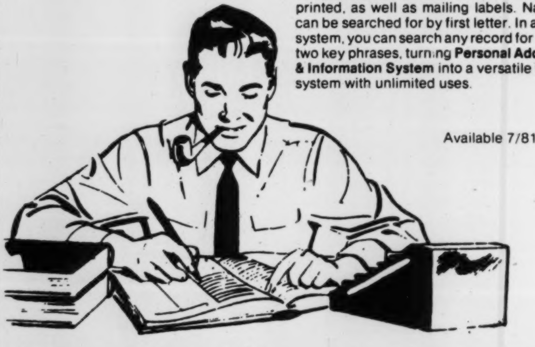

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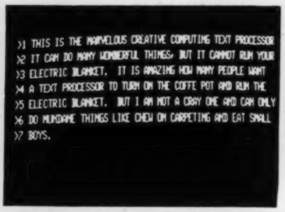

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>1 THIS IS THE MARVELOUS CREATIVE COMPUTING TEXT PROCESSOR
>2 IT CAN DO MANY WONDERFUL THINGS, BUT IT CANNOT RUN YOUR
>3 ELECTRIC BLANKET.  IT IS AMAZING HOW MANY PEOPLE WANT
>4 A TEXT PROCESSOR TO TURN ON THE COFFE POT AND RUN THE
>5 ELECTRIC BLANKET.  BUT I AM NOT A CRAY ONE AND CAN ONLY
>6 DO MUNDANE THINGS LIKE CHEW ON CARPETING AND EAT SMALL
>7 BOYS.
```

Developed exclusively for the TRS-80 this program lets you use the computer to enter general text or business letters, edit and modify your work, save text on cassette tapes, and print out a perfect report, document, or letter every time.

CS-3504 Disk (32K) $24.95
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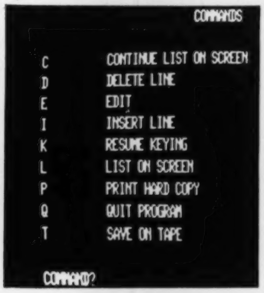

```
                            COMMANDS

 C          CONTINUE LIST ON SCREEN
 D          DELETE LINE
 E          EDIT
 I          INSERT LINE
 K          RESUME KEYING
 L          LIST ON SCREEN
 P          PRINT HARD COPY
 Q          QUIT PROGRAM
 T          SAVE ON TAPE

COMMAND?
```

Editing commands are similar to those used in Level II BASIC, so there are no complicated new commands to learn. Lines may be either inserted or deleted. A special format is available to speed entry of business letters. Final printout can be done in numbered pages and you may print multiple copies.

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Disk CS-3510 (48K) $24.95 Available 7/81

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2. Do you own a video game system (Atari, Intellivision, Odyssey)?
☐ A. Yes ☐ B. No

3. How many game/educational cartridges do you have for the system?
☐ A. 1-5 ☐ B. 5-10 ☐ C. 11-15 ☐ D. 16-20 ☐ E. 21-25 ☐ F. More than 25

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